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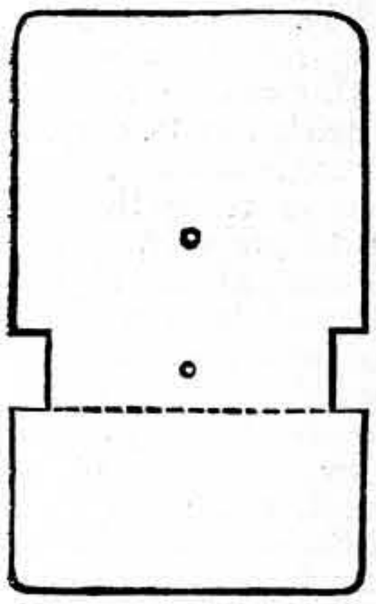
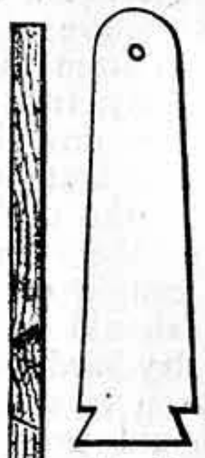


Fig. 2.



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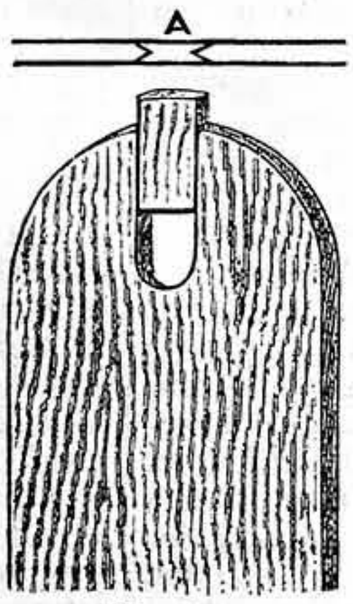

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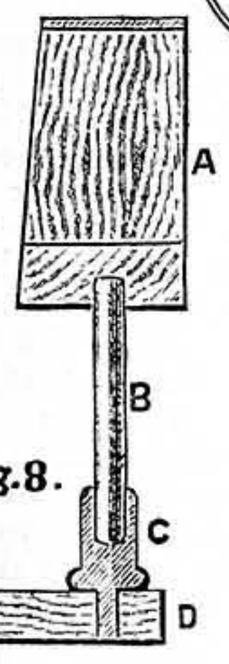

Fig. 8.

Fig. 12.

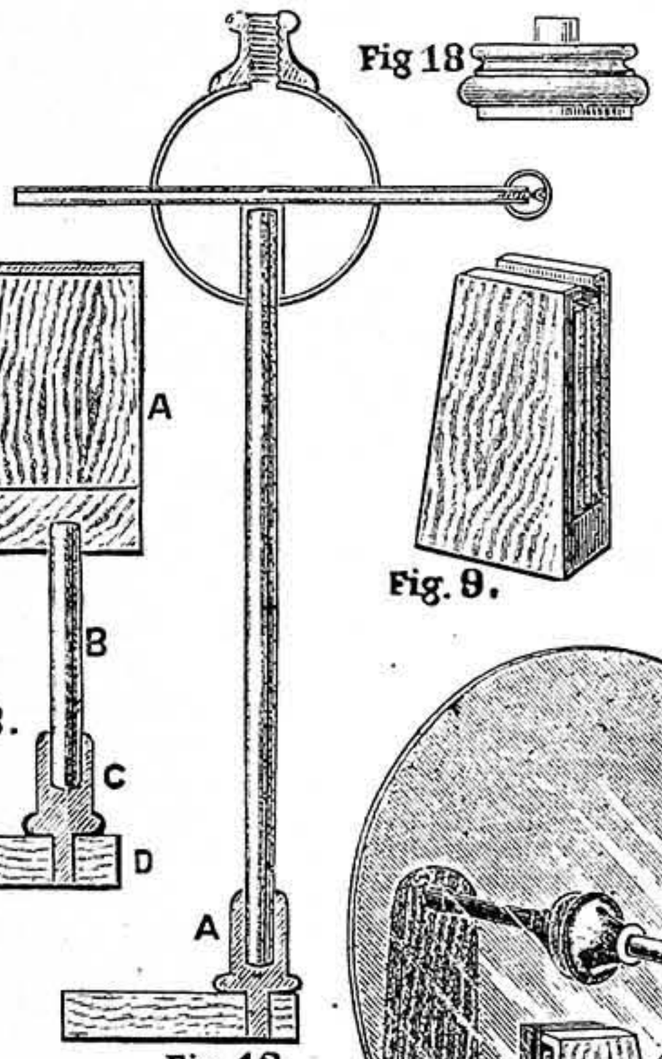

Fig 18

Fig. 9.

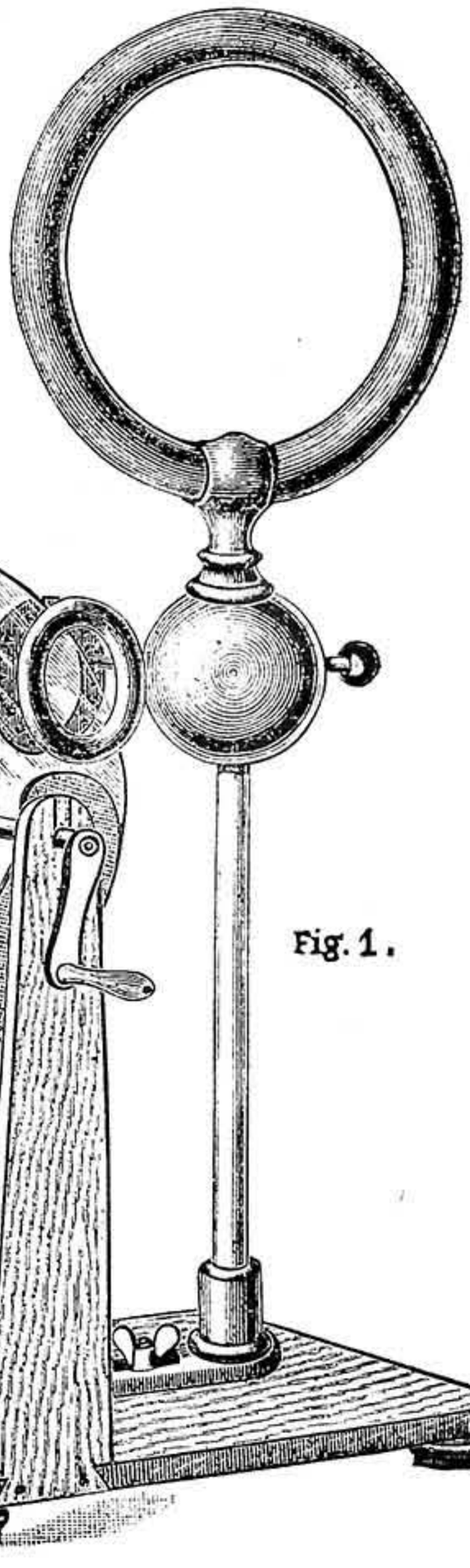

Fig. 1.

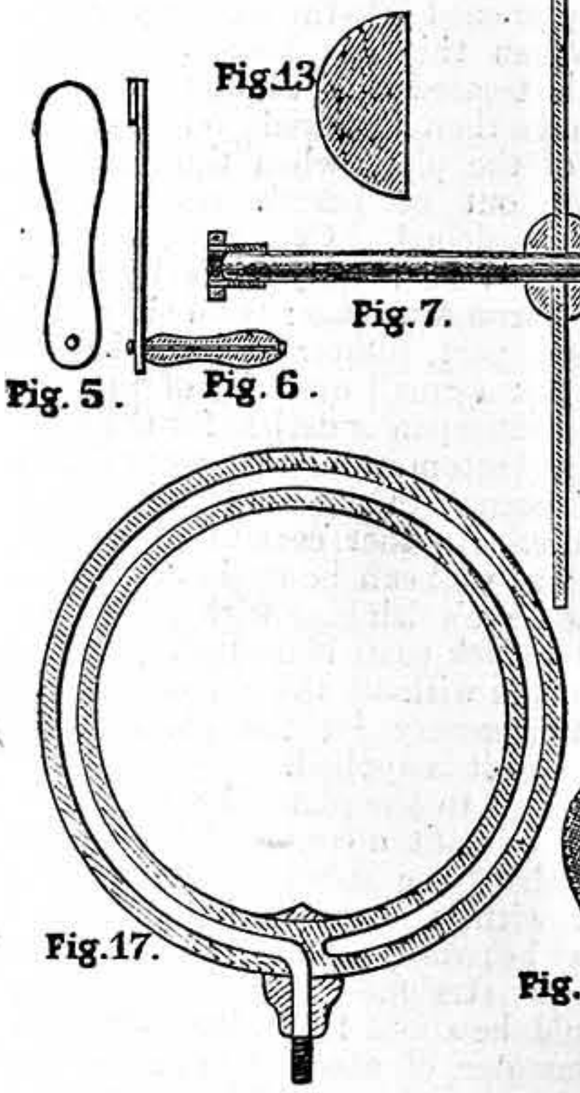

Fig. 17.

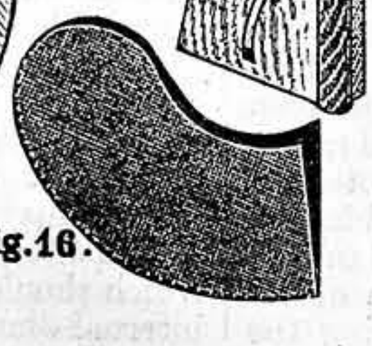

Fig. 16.

Fig. 11.

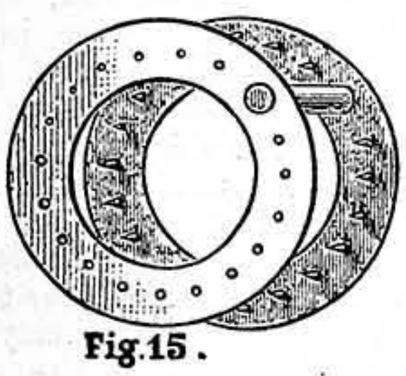

Fig. 15.

Fig. 5.

Fig. 6.

Fig 13

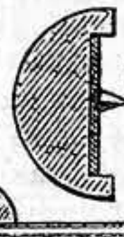

Fig. 14.

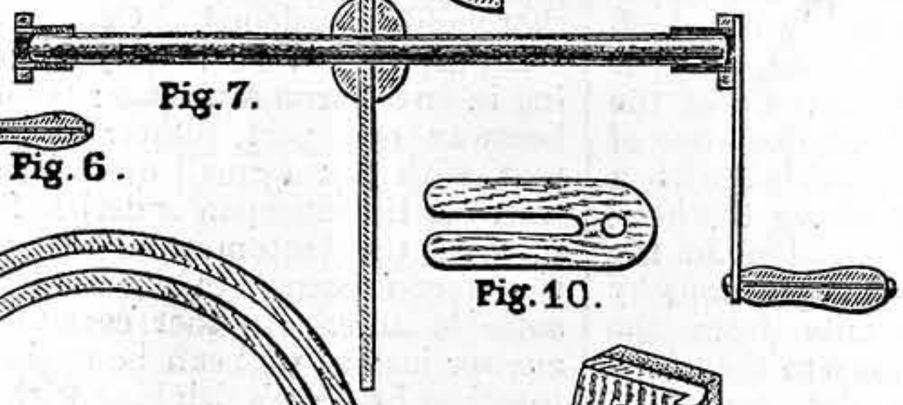

Fig. 7.

Fig. 10.

Fig. 1.—Winter Electrical Machine. Fig. 2.—Plan of Baseboard—A, Side Elevation. Fig. 3.—Plan of Supporting Standard for Plate. Fig. 4.—Enlarged Detail of Standard, showing Movable Wedge—A, Section of Wedge. Fig. 5.—Plan of Handle. Fig. 6.—Side Section of Handle. Fig. 7.—Section of Plate. Fig. 8.—Section of Rubber Holder. Fig. 9.—Side View of Rubber Holder with Cushions in Position. Fig. 10.—Plan of Foot of Rubber. Fig. 11.—Rubber. Fig. 12.—Prime Conductor. Fig. 13.—Section of Wooden Collecting Ring. Fig. 14.—Section of Collecting Ring, showing Inner Metal Ring. Fig. 15.—Metal Collecting Ring. Fig. 16.—Silk Flap. Fig. 17.—Section of Winter Ring, showing Inner Metal Ring. Fig. 18.—Supporting Foot for Baseboard.

THE WINTER ELECTRICAL MACHINE AND ACCESSORY APPARATUS.

BY CHAS. A. PARKER.

PREFATORY—DESCRIPTION OF THE WINTER FRICTIONAL MACHINE—THE BASEBOARD AND SUPPORTING STANDARDS—THE PLATE-GLASS DISC—FITTING SPINDLE TO PLATE—ELECTRICAL CEMENT—THE HANDLE—THE RUBBER—THE RUBBER CUSHIONS—THE PRIME CONDUCTOR—THE COLLECTING RINGS—ADJUSTING SCREWS FOR BASEBOARD—THE SILK FLAP—MAKING THE WINTER RING—SUPPORTING FEET OF BASEBOARD.

THE science of electricity may be justly described as being one of the most sublime examples of the might of the human intellect, for by its agency man has brought a power subservient to his will which plays an important part throughout nature, and whose applications are now to be found in almost every branch of science. "*Nil mortalibus arduum est*," wrote Horace in speaking of Prometheus, of mythological fame, who is said to have stolen the fire from heaven; and it may be rightly said that the truth of this assertion has been repeatedly proved by modern science, although the writer of the passage could little have thought how near becoming verified would be the fable of Prometheus in after ages.

This subtle agent which we call electricity would appear to be uniformly diffused throughout nature, existing in almost every substance without giving any outward indication of its presence until called into existence either by mechanical, chemical, or physical action, when it is capable of producing effects that are as wonderful as they are startling.

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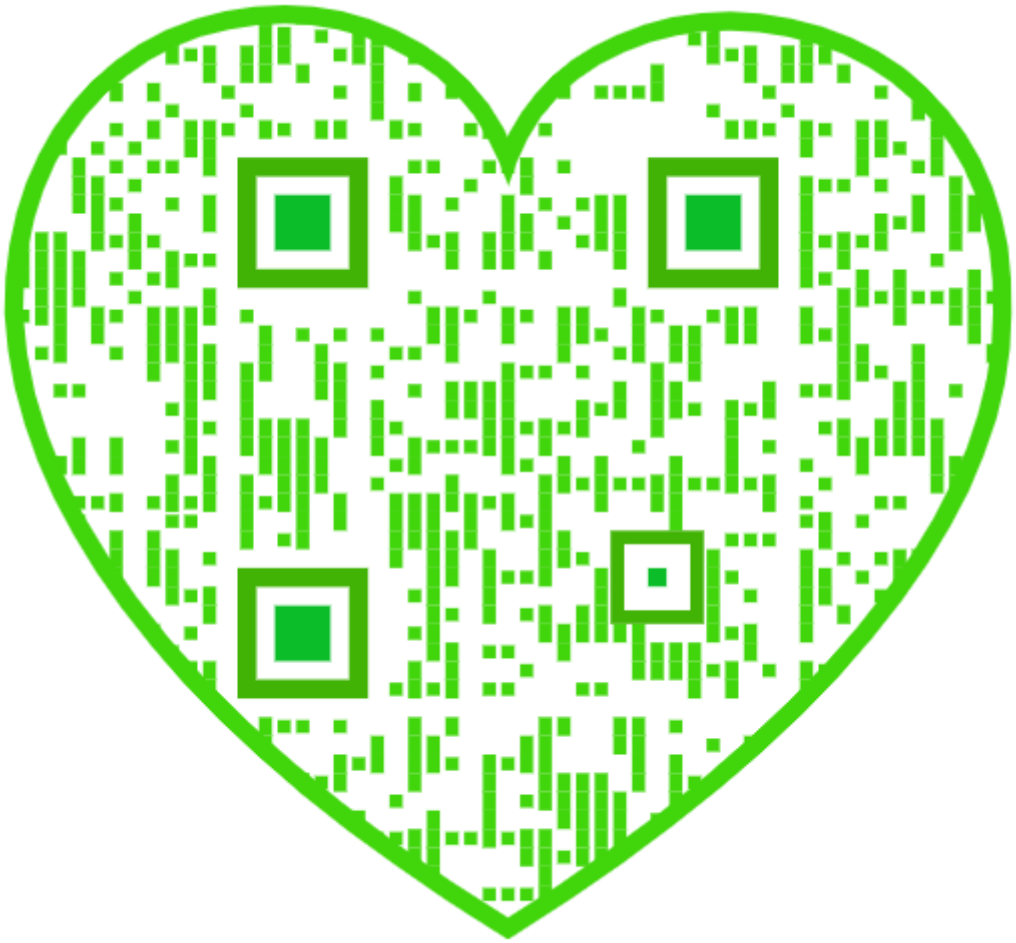

During the present century electrical knowledge has progressed with rapid strides, and scientists have striven their utmost to subdue and apply this subtle power to domestic and commercial purposes, with the result that it has now become a most valuable helpmeet of man; the development of this branch of physics having resulted in such inventions as the electric telegraph, the electro-motor, electric light, electric railway, etc., and doubtless, as time goes on, we shall witness its still further development.

In the present series of articles it is the writer's intention to describe the construction of an electrical machine and accessory appliances, such as would be used by the student when studying that branch of electrical science known as frictional electricity, which, by the way, is always particularly fascinating to the experimentalist.

For obvious reasons it will be impossible to enter upon the theoretical or experimental portion of the subject in the present series of papers, as it would be out of place in this publication. I shall therefore confine myself to the practical construction of the apparatus necessary for the performance of experiments such as are described in the text-books devoted to the subject of frictional electricity.

The plate electrical machine may be said to be the most popular form of frictional machine ever introduced, as it affords a ready means of generating electricity for the experimental purposes of the student or science teacher; and of all the various modifications and improvements in plate machines which have from time to time been devised, the addition of the Winter ring must claim attention as being one of the most useful.

In construction, the machine about to be described may be said to consist of a glass or ebonite plate mounted between a couple of upright standards attached to a substantial wooden base. The rubber holder, which is mounted on a glass stem attached to an adjustable wooden foot, occupies a position on the baseboard about midway between the two standards, and is made in the form of a U, through which the plate passes as it revolves. A couple of flat pieces of wood furnished with felt pads and brass springs are pushed into the rubber holder, one on either side of the plate, against which they are forced by the pressure of the springs, a slight projecting ledge at the back serving to retain them in position whilst the machine is being worked. A double wing of thin silk is attached to the rubbers and curved in the form of the plate, to which it adheres by electrical attraction, thus serving as a means of conveying the electricity to the collecting rings of the prime conductor. The latter consists of a hollow brass ball mounted on a glass support attached to an adjustable wooden foot similar to the rubber, the side of the conductor next to the plate being fitted with a projecting arm and a couple of wooden collecting rings which are furnished with a row of metal spikes or pins on their inner faces, arranged in such a manner as to almost touch the plate on either side; the outer side of the conductor having a brass ball and stem from which to suspend the apparatus. The Winter condensing ring, which is the most important part of the entire machine, is made to fit into a hole in the top of the prime conductor, and consists of a hoop of stout iron rod let into a highly polished ring of wood, an attachment of this description enhancing the power of the machine about threefold. In the writer's estimation, this machine is undoubtedly one of the most perfect, useful, and convenient forms of frictional machines ever devised.

Turning now to the constructive details, we come first of all to the baseboard and supporting standards for the plate, which are illustrated in Figs. 2 and 3. For the first named we shall require a piece of thoroughly well-seasoned mahogany, measuring about 12 in. by 20 in., and about 1 in. or 1½ in. thick. The importance of employing thoroughly well-seasoned wood cannot be too strongly impressed upon the reader.

When the board has been sawn to the required size, it will be necessary to round off the four corners by means of a panel saw, after which the sides and edges should be dressed up and shot by the aid of a plane until they are perfectly square and true with the face.

When this has been done, the baseboard may be placed aside for a short time whilst a couple more pieces sawn from the same board are being dressed up in a similar manner to form the two supporting standards for the plate. Each of these should measure when finished 15 in. long and 4½ in. wide at the lower end, tapering to 3 in. at the top, the lower end of each standard being sawn to the form of a dovetail, as shown in Fig. 3, which will then allow of its being securely fitted on to the baseboard. A pencil line drawn across the surface of the baseboard at 6½ in. from one end of the board, as shown by the dotted line in Fig. 2, will indicate the position for the first cut of the mortise to receive these dovetails, which are now cut to the required form by means of a saw and chisel. Before proceeding further, a hole about ¾ in. diameter should be bored through the upper end of each standard, at exactly one inch from the rounded end of the wood, in order to form the bearings for the spindle of the plate; and when this has been done one of the standards should be provided with a movable wedge, fitted just above the hole, in order to make suitable provision for the removal of the plate. This may be done by making a couple of saw-cuts from the rounded end of the wood down to the aforesaid hole, thus forming a slot, each side of which will now require to be cut to a sharp bevel. A small block of wood of suitable size is now grooved along opposite sides in the form of a V by means of a saw and chisel, and then made to slide tightly along the slot just formed, as will be seen by reference to Fig. 4. If considered necessary, a hole of sufficient diameter to take a pin, about the size of an ordinary blanket pin, may be bored through the standard and into the wedge, for the purpose of retaining the latter in position during the working of the machine.

As soon as the two standards have been prepared, it will be advisable to mark the position for the mortises on opposite sides of the baseboard into which the lower dovetails of the standards are to be fitted; cutting each of these mortises by the aid of a saw and chisel, and afterwards attaching each one in turn to the baseboard by means of a couple of 2 in. brass screws and some good glue.

Now that the wooden framework of the machine has been described, it behoves us to turn our attention to the glass plate, and the manner in which it is to be mounted between the two standards. For this size machine we shall require a 12 in. circular disc of good plate-glass, provided with a ¾ in. hole in the centre through which to insert the spindle upon which it turns. It will be necessary to procure this from an electrician, as the size, shape, and thickness render it impossible for an amateur to cut and prepare a glass plate of this description. The usual charge for a plate of these dimensions will be found to range from 8s. 6d. to 10s. 6d. It may not be out of place to draw attention to the possibility of getting a plate from a clock-glass manufacturer at prices considerably lower than the above: for example, Mr. Jude, watch, clock, and barometer glass manufacturer, of Clerkenwell, would supply a glass disc according to the above description for 4s. 6d.—carriage, of course, being extra, as this is the price of the disc.

Having secured a suitable glass disc, we shall next require a 12 in. length of ¾ in. glass rod to form the spindle upon which the plate may turn: this can be readily obtained from any electrician at 1s. per lb. The rod must first be roughened at either end, also in the middle, in order that it may take the cement properly, after which a couple of bosses, about 1¾ in. diameter, should be turned from a piece of sound dry hard wood, and then made to fit tightly on to the spindle. One of the bosses should now be cemented in the middle of the rod by the aid of a small quantity of cement, and when this has set quite firm, a little more should be brushed over the inner face of the boss, after which the glass disc is very carefully let on to the spindle while the cement is moist, being pressed into the closest possible contact. When this has been done, the other boss is treated with cement in a like manner and then lowered on to the other side of the plate, when the whole is placed aside out of harm's reach until thoroughly hardened. Cement used for this purpose can be readily made by melting in an old iron saucepan: resin six parts, beeswax one part, plaster of Paris half a part, with just a small quantity of turpentine. A tin saucepan is useless for the purpose, as the bottom would come out; it is therefore necessary to use an iron pot or a suitable ladle. Another cement which will answer just as well can be made by mixing together Le Page's fish glue with plaster of Paris until a thick paste is formed. As this cement is made without the aid of heat, it will be unnecessary for the glass to be warmed before it is applied.

On returning to the plate, the next proceeding will be to fit a couple of brass caps on to the ends of the spindle, and likewise provide it with a handle. The caps or mounts may be readily formed from a couple of gasfitters' straight brass nose-pieces, which should be about 1½ in. long, with an internal diameter of about ⅞ in., each one being furnished with a small hexagonal or round nut tapped to screw on to it. Before doing anything else, it will perhaps be advisable to prepare the handle. For the arm of this a piece of stout brass plate about ⅛ in. thick should be cut and filed to the shape of Fig. 5, care being taken to finish it off neat and smooth, with a small hole drilled through it at the taper end, as shown in the diagram. A brass nut belonging to one of the nose-pieces may now be taken, and soldered on to the broad end of the metal in the position indicated in Fig. 6; after which a small wooden sleeve of suitable size should be turned in a lathe to form the handle of the machine. This sleeve must of course be furnished with a longitudinal hole, into which the metal rod of the handle may be loosely fitted. This

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rod should now be riveted and soldered into the hole at the narrow end of the handle crank, when the wooden sleeve just prepared may be slipped on to the rod, and then retained in its place by means of a small button riveted on to the outer end of the rod. It is almost needless to say that the sleeve of the handle must be arranged in such a manner as to revolve with perfect freedom.

At this stage of the proceedings the two nose-pieces should be cemented on to the ends of the spindle, and then the plate may be mounted in position between the two standards of the machine, in order to ascertain whether it is running quite true and with perfect freedom; and if so, the nut may be screwed on to the projecting portion of the nose-piece on one side of the machine, whilst the handle is screwed on to the opposite end of the spindle—as will be understood by reference to Fig. 7, which shows the sectional appearance of the plate and spindle. When the plate has been remounted in a satisfactory manner, and is found to be running quite smooth and true, it will be time to turn our attention to the preparation of the prime conductor and the rubber, commencing with the latter, which is illustrated in Fig. 8. The rubber holder, shown at A, may be made from a single block of wood, measuring 5 in. by 2½ in., with the two sides tapering from 3 in. at the base to 2½ in. at the top, the rectangular slit to contain the rubber cushions being readily formed by first making a couple of parallel saw-cuts for 4 in. longitudinally down the block, and then removing the wood between the saw-cuts by the aid of a keen-edged mortise chisel, after which the sides are carefully smoothed off, and a narrow ledge glued on to the top of each side, as will be seen by reference to A, Fig. 8, and to Fig. 9. A 4½ in. length of ¾ in. glass rod (B, Fig. 8) is now cemented into a hole of sufficient size, bored for its reception in the under-part of the rubber holder by means of a suitable centre-bit, the other end of the glass rod being cemented into a turned wooden socket, similar in appearance to C, Fig. 8. This socket need not be turned according to any exact dimensions, but should be made proportionate to the remainder of the rubber holder. It should be furnished with a ¾ in. projecting pin at the bottom, which must be glued into a hole bored in one end of a small slotted foot, cut to the form of D, Fig. 8, which is drawn in plan in Fig. 10. This foot may measure about 4 in. long, 1½ in. or 2 in. wide, and 1 in. thick, being sawn from a piece of sound baywood by means of a fret or panel saw, and when carefully cleaned up it may be glued on to the lower wooden socket of the rubber holder, which is now completed, with the exception of a pair of cushions.

These cushions may be made from a piece of ⅜ in. mahogany, which is planed down to about ¼ in. thick in such a manner as to leave a slight ledge projecting along one side, as will be seen in Fig. 11. This arrangement will prevent them from being carried through the holder by the motion of the plate. A piece of spring brass, about ½ in. wide and 3 in. long, will require to be riveted to the middle of the outer side of the wood, in order that the cushion may be pressed against the plate with a uniform pressure, after which the rubbers are completed by gluing a piece of thick soft felt on to the outer side or face of each one, in the manner indicated in Fig. 11; the rubbers when in place occupying the position indicated in Fig. 9, which is a side view of the rubber holder.

The rubber being finished, we must next turn our attention to the prime conductor, which is illustrated in Fig. 12. This consists of a large brass ball, mounted upon an insulating glass stem, cemented into a suitable turned wooden foot, similar to the rubber. The ball has three openings for the attachment of apparatus—one at the top, to take the stem of the Winter ring, and the other two in the centre, upon opposite sides. For this large ball the writer can recommend a large brass knob, such as will be found upon good-class bedsteads, one of which will answer this purpose very well. The ball should be about 4 in. in diameter, and must be provided with two ¼ in. holes in the centre of the body, and a ⅞ in. opening exactly at the top, as may be understood by reference to Fig. 12. Two lengths of brass tubing must now be inserted, and soldered into each of these openings, in the position shown in Fig. 12: one piece of stout tubing, 9 in. in length, being soldered crosswise through the centre of the ball from one opening to the other, with about 2½ in. projecting on either side; the second piece, which is of much larger diameter, being put through the opening in the top of the ball, and soldered flush with the surface. A fair-sized brass ball is to be soldered to one end of the small projecting tube, and the collecting rings, about to be described, are attached in a like manner to the other end.

To make these collecting rings, turn in a lathe a pair of half round wooden rings, about 3 in. in diameter and ¾ in. in width, using for the purpose a piece of sound dry mahogany, the surface of which is rounded on the outside, and left quite plain on the inside, as shown in section in Fig. 13. A couple of flat brass rings, ⅜ in. wide, with an outside diameter of 2⅞ in., are now turned from a stout piece of metal, and are then made to fit into grooves prepared for their reception in the flat sides of the wooden rings, being sunk slightly below the surface of the latter, as shown in section in Fig. 14. About twenty small holes should now be drilled at equal distances apart round each of the metal rings, into which a corresponding number of small brass nails or pins, about ¼ in. long, can be riveted and soldered in the manner shown in Fig. 15, thus forming the comb of the conductor by which the electricity is collected from the plate. When this has been done, the two metal rings are joined together (with the pins inside) by means of a short bar of brass rod, which is of sufficient length to allow of the glass plate of the machine just passing between the pins of the rings without touching (*see* Fig. 15). This bar must be riveted into holes drilled for its reception in each ring, and after the collecting rings thus joined together have been soldered to the projecting rod of the prime conductor, the outer wooden casing may be cemented on to each ring.

At this stage of the proceedings a 13 in. length of ¾ in. glass rod should be cemented into the large opening at the top of the conductor, in the manner shown in Fig. 12.

Assuming one of these bedstead knobs to be employed for the conductor, it will be provided with a slight projecting stem, which will be found very useful for the subsequent attachment of the Winter ring, the stem of which should be furnished with a corresponding tap, to enable it to be screwed into the stem.

A mahogany socket must now be turned in a lathe to the form of A, Fig. 12, and then cemented on to the lower end of the glass stem of the conductor, the projecting pin with which the socket should be provided being glued into an adjustable slotted foot similar to the rubber before described.

A couple of brass wing-nuts, and screws, about 2½ in. long, should now be let into the baseboard from the underneath, being planted one at about 7½ in. from the front end, and the other at 8½ in. from the back. The exact position should, however, be ascertained by trial. They must, of course, occupy the central line of the baseboard, and the heads of each nut should be let into the underside of the wood, just flush with the surface, being afterwards cemented in position by means of the ordinary electrical cement, or a mixture of plaster of Paris and glue.

The rubber and the conductor may now be clamped in position upon the baseboard, in order to be certain that the plate runs perfectly true, and everything is satisfactory, as it should be. As soon as this has been ascertained, a curved silk flap (Fig. 16) must be prepared and affixed to the rubber, to serve as a means of conveying the electricity to the conductor. The exact length of the silk required may be marked upon a piece of brown paper, which is held in position against the plate whilst the rubber and conductor are in their place. The silk should be arranged so as to reach from the outer edge of the rubber to within about half an inch of the collecting rings of the prime conductor, the width being the same as the height of the rubbers. From the template thus obtained it will be an easy matter to cut a couple of duplicates in thin black sarcenet, allowing just a trifle more than the exact plan to allow for turning in when sewing them together. A portion of the covering of a disused silk umbrella will be found to answer this purpose very well, provided that it is not slit or damaged in any way. As soon as the pieces of silk have been cut they must be carefully machined together along the curved side, after which the flap thus formed is glued on to the outer sides of the rubber, with the machined portion turned inwards next to the plate. Thus prepared, the electrical attraction will cause the flap to adhere to the plate upon the handle of the machine being turned. Only the semi-circular curve of the silk is to be stitched, as the remaining portion of the silk simply requires to be cleanly cut by means of a pair of scissors.

As before stated, the Winter ring, which forms the attachment of the prime conductor, consists of a stout iron ring enclosed in a polished wooden casing, which should equal the diameter of the plate of the machine, in order to obtain the best results. It naturally follows, therefore, that the construction of a ring of this description will be a trifle beyond the capabilities of the average amateur, owing to the necessity for using a large-size lathe in which to turn the wooden ring. Nevertheless, as there may be some who would be in a position to make the attempt, I will describe the mode of procedure.

For a ring suitable for the machine under description, a sufficient length of moderately stout soft iron rod, about the thickness of an ordinary cedar pencil, must be bent into the form of a 12 in. ring, having a short projecting stem about 3 in. in length, similar in appearance to Fig. 17. The stem should now be tapped, in order that it may

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be screwed into the opening in the top of the prime conductor, after which it must be provided with a stout casing of thoroughly dry wood. To make this ring, a couple of accurately planed boards, of a uniform size and thickness, should be mounted upon the face-plate of a lathe, for each one to be furnished with a groove of a sufficient depth to take half the thickness of the iron ring, which is made to fit into these grooves in such a manner that the two surfaces of the wood can be closed over the ring and glued together. After the grooves have been cut, each ring is in turn detached from the board, and the two are glued together securely, with the grain of the wood crossing, and the metal ring between them, after which, when the glue has thoroughly set, the outside of the ring is carefully rounded off and smoothed with glass-paper.

A small, neat, pear-shaped boss must now be turned in a lathe and fitted on to the ring, just at its junction with the stem. This boss must of course be made in two halves, and furnished with a couple of grooves crossing the flat surface of the wood in the form of a T, the shorter groove of which should be of a suitable form and depth to admit that portion of the ring where it forms the junction with the stem.

Those of my readers who do not wish to have the trouble of making the Winter ring themselves can obtain a 12 in. ring ready prepared, and with the outer casing highly polished, at 8s. 6d., from Messrs. King, Mendham & Co., a firm resident in Bristol.

At this stage of the proceedings nothing remains to be done but to turn four ornamental supporting feet, similar in design to Fig. 18, and then glue and screw one of these at each corner of the base, after which the entire wood-work of the machine may be varnished or French polished, according to the taste of the maker. Those who are unable to French polish will do well to use a hard-drying ebony enamel: such, for instance, as is to be found in the cheap black enamel varnish supplied by Messrs. Palmer & Co., St. Luke's, London.

HOW TO MAKE A WASH-TUB.

BY H. HINGE.

INTRODUCTION—QUALITY OF WOOD—SIZE, ETC.—CUTTING OUT WOOD — MAKING — PUTTING TOGETHER—FINISHING.

AMONG the many articles which amateur wood-workers make, perhaps there is none which will please the "guid wife" better than a wash-tub (Fig. 1), which, if properly made, will last a lifetime, and, besides having many other advantages over earthenware pans, it cannot get broken.

Quality of Wood.—As the tub has to hold water—or, in other words, be water-tight—the wood must be as sound and good as we can get it, either white or red deal—¾ in. or 1 in. thick will answer the purpose very well, if it is free from dead knots and shakes.

Size, etc.—We shall find a convenient size to make for use about 2 ft. 4 in. long, 15 in. wide on the top, and 9 in. deep.

Cutting out Wood, etc.—As the tub is on the taper all ways, the best way to cut out our wood from the board will be as shown in Fig. 2. A considerable saving of wood is effected in this way. A "bevel" would be a very useful tool to get the right angle to cut and true the ends up with, but if we have not got one, we can manage very well without. Square up a piece of thin deal or cardboard, 12 in. or 14 in. long and 9 in. broad, and then take it 2½ in. less on the bottom edge. We shall then have a templet, 2½ in. out of square, to which we must work all our ends.

Making, etc.—After truing up the sides and ends correctly to "templet," and in pairs of the same size, we must take the sides and mark up from the ends with a gauge a line 1 in. clear from the edge, and all four ends of the two sides must be marked with this gauge, and then another gauge-line run up parallel with the first at a distance from the first line of the thickness of the stuff at the thinnest place. This is for the grooves to receive the ends; and, as the ends must fit in tight, we had better have them a little too small than too large. These must now be grooved out to a depth of

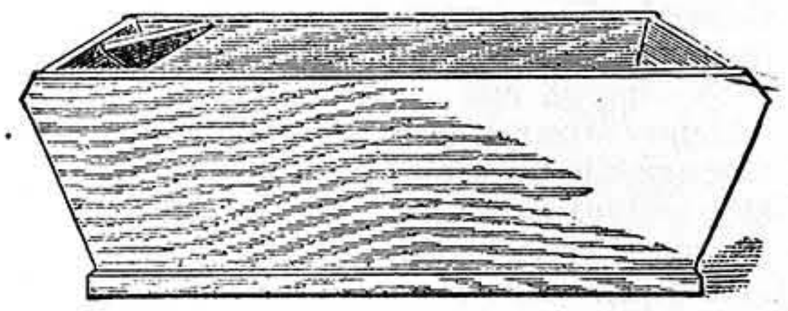

Fig. 1.—Wash-tub complete.

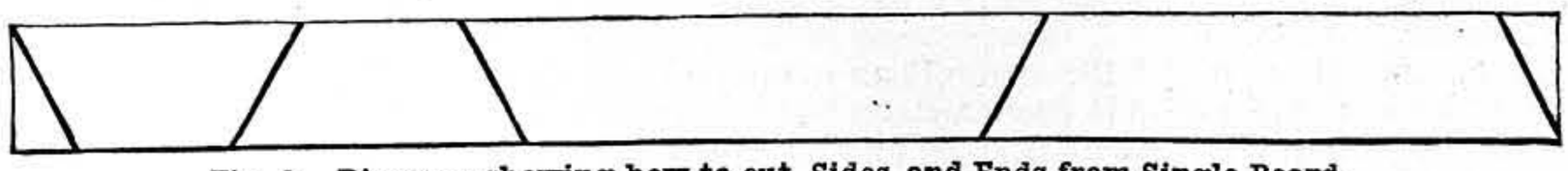

Fig. 2.—Diagram showing how to cut Sides and Ends from Single Board.

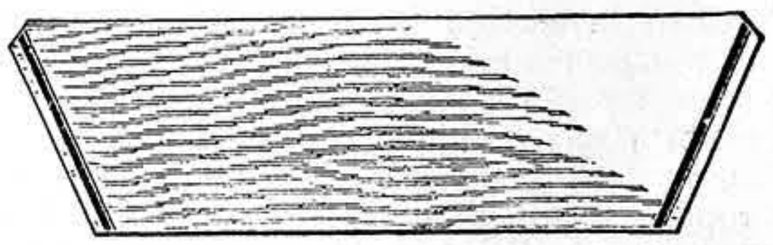

Fig. 3.—Side grooved to receive Ends.

about ¼ in., cutting down with a tenon-saw and cleaning out with a small chisel, taking care to get the grooves of an equal depth all the way through. The sides will then have the appearance of Fig. 3. By placing the sides and ends together, as they will be when together (not putting the ends in the grooves), it will be seen that the ends of the ends will want to be on the bevel a little to make a close joint. A shaving or two taken off with a sharp plane, where wanted, will remedy this, so that when the tub is put together all joints will be true and close. The ends must now be taken to a thickness on the ends, to fit in tight in the grooves, taking just the sharp edge off on the inside and planing away any surplus wood on the outside; but be sure and have them fit nice and tight (not too tight).

Putting Together, etc.—We shall now require some white-lead, which should be put in the grooves with a putty-knife or chisel—not too much, but covering the wood all over. The tub should now be nailed together with 1½ in. or 2 in. nails, put in about 2 in. apart. A fine 1½ in. screw, put in at each top corner instead of a nail, will make a much better job. The bottom edge of the tub should now be levelled off as true as possible, and then with a very dull iron chisel or the wrong end of a hammer, and using another hammer to strike with, bruise down a groove round the middle of the bottom edge; fill this groove with white-lead, also a thin coat on the rest part of the bottom edge. The bottom should now be planed up true (we shall find a board 11 in. wide to be the right breadth without jointing), and nailed firmly down, taking care that none of the nails split or point out. A much better job is made by screwing the bottom down with fine 1½ in. or 2 in. screws. All surplus white-lead should now be cleaned off, and all interstices filled up with the same. We should now turn our attention to the top edge, and clean this off as nicely as possible with a sharp plane, cutting off the corners as in Fig. 1, and taking off all sharp edges with sand-paper. Two pieces of 1½ in. square stuff should now be screwed on from the inside to form handles on the ends. These will be much better if hollowed out a little on the underside (before screwing on) to catch hold of. We must now fit a piece in the corner to hold the soap, which should fit nicely, but not go down to the corner by ¾ of an inch, to allow the soap to drain. This should be nailed in from the outside. All nails and screws should be punched and screwed below the surface, and filled up with putty mixed with white-lead. The tub is now complete, and should be allowed to stand a few days before use to allow the white-lead to harden. The durability and appearance of the tub will be greatly increased by giving it a few coats of paint inside and out; but, of course, this must be left to the taste of the worker.

If the inside of the wash-tub is not painted—and there will be some, I dare say, who will think it unnecessary to do this—the joints of sides, ends, and bottom should receive a good coating of white or red lead.

KNOTTING, SPLICING, AND WORKING CORDAGE.

BY LAUNCELOT L. HASLOPE.

FANCY KNOTS.

WALL KNOTS—STOPPER KNOTS—MASONS' WHIPPING—CROWNING—MANROPE KNOTS—DOUBLE WALL KNOT, SINGLE CROWNED—TACK KNOT—MATTHEW WALKER—SINGLE DIAMOND—DOUBLE DIAMOND—SHROUD KNOT—FRENCH SHROUD KNOT—SPRITSAIL SHEET KNOT—BUOY ROPE KNOT—TURK'S HEAD.

WE come now to a perfectly different style of knot which, though they are termed fancy knots, are not necessarily used for ornamental purposes, but are often of considerable benefit; indeed, we could hardly do without some of them aboard ship. One of the most commonly used knot of this group is the "Wall Knot." Fig. 82 shows the knot ready for hauling taut. First unlay the strands at the end of a rope and make a bight with one strand, A; hold this to the standing part with the thumb of the left hand, then make a loop with the next strand, B, round the end of the first strand, and bring the remaining strand, C, round the end of the strand B and through the bight of A.

If the ends are taken round once more and brought up in the centre of the knot, it is called a "Stopper Knot." In this case the ends are whipped together and cut off level. How the "Wall Knot" acquired its name was always a puzzle to me until I once happened to meet with directions in a very old book on rigging, for making a basket which was

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to have "a small walnut knot crowned at the end." A fancied resemblance to a walnut no doubt gave it its name originally, which, for euphony's sake, was contracted to wall knot.

Fig. 83 is the "Stopper Knot" finished. Fig. 84 shows the crowning commenced. Open the strands of a rope as before, but do not put a seizing round the rope. Lay the strand A down over the centre of the rope, and bring strand B down over A and strand C over B and through the bight of A. Fig. 85 shows how the strands tie when they are nearly taut. The strands in Fig. 84 are hardly in the position which they occupy when the knot is actually being made, as they are then much snugger; but to show clearly their relative positions I was compelled to draw them as they appear in the figure. In criticising the illustrations, and of these knots in particular, I hope my readers will take into consideration the extreme difficulty of making them so as to show with any clearness the method by which the result was arrived at. Making a knot is one thing: showing on paper the method of making it is quite another. Crowning may be used by itself as a method of preventing the strands of a rope unlaying while in use. In this case, after crowning as above, pass one end over the next strand in the standing part, and under the following one. Do the same to each of the other strands in succession. This may be repeated and the ends cut off. Masons, whose ropes have to stand a good deal of knocking about, generally use this plan; for this reason it is called "Masons' Whipping." Though very strong and standing hard usage well, this is not the neatest way of finishing the ends of a rope. Crowning may also be used in connection with other knots. For instance, we may crown first and wall afterwards, as shown in Figs. 86 and 87. Fig. 86 shows the crowning in the centre of the knot hauled taut; this is made on the end of a rope as just described. We now make a single "Wall Knot" under the crowning. When the knot is tightened it will appear as in Fig. 87, and is called a "Manrope Knot." A single "Wall Knot" may be crowned after it is made; we then have a single wall and a single crown. If now we wall again by passing one end under the part of the first walling next to it and bring it up through the same bight, and do the same with the other two strands, the result is a knot with a double wall and a single crown. A double-walled double-crowned, called a "Tack Knot," is made as the last knot—that is, double-walled and single-crowned. Now lay the ends by the sides of those in the single crown, and with the aid of a pricker bring them down through the double walling and they will be alongside the standing part of the rope. The knot is shown completed, with the ends cut off, in Fig. 88.

A Matthew Walker (Fig. 89) gives the knot open ready for being hauled taut. How this knot came by its curious name I believe is not known. I learnt it some forty years ago, and the captain, an elderly man, who taught me, had known it all his nautical life, so I think we may take it that its origin is lost in the mists of antiquity. After putting a seizing round the rope and unlaying the end as before, bring one strand, A, round the rope and put it through its own bight, the next strand, B, underneath, through the bight of A and through its own bight, and the last strand, C, underneath, through both the other bights, and lastly through its own bight. Fig. 90 is the knot completed. The "Diamond Knot" is an ornamental knot made some distance from the end of a rope; it is therefore necessary

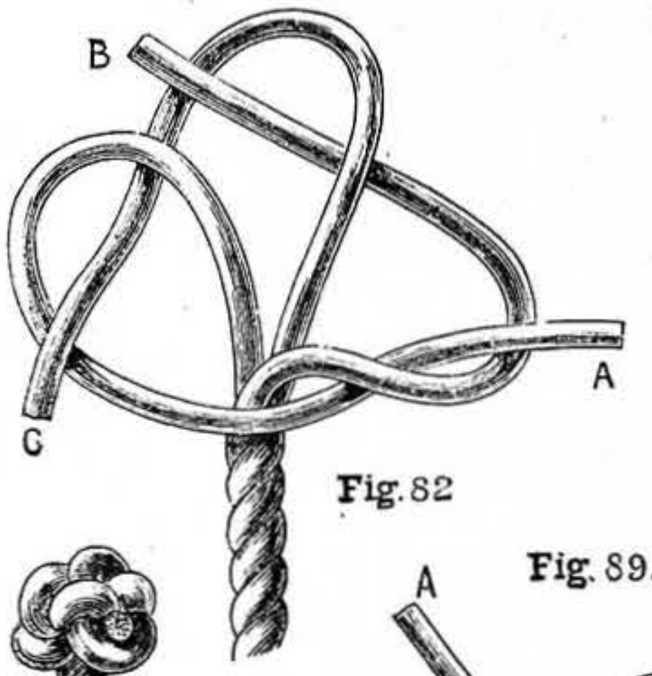

Fig. 82

Fig. 83.

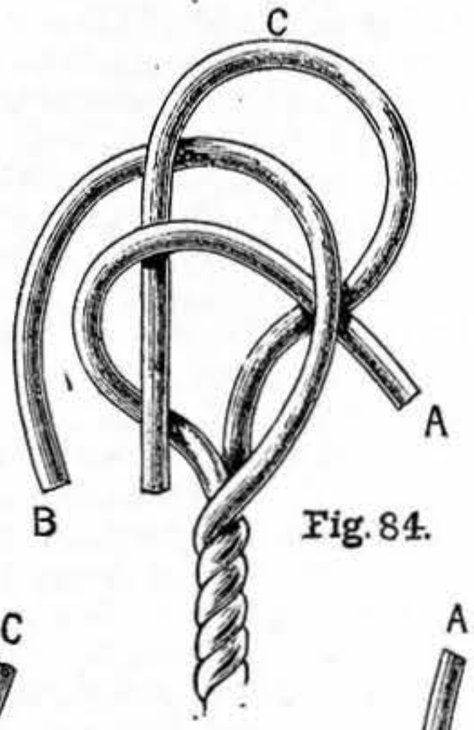

Fig. 84.

Fig 85.

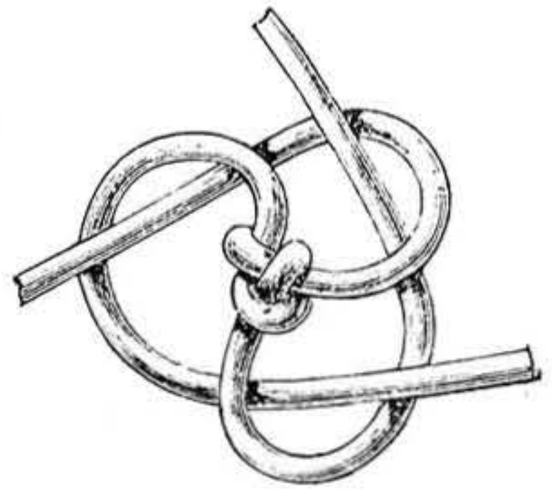

Fig. 86.

Fig. 87.

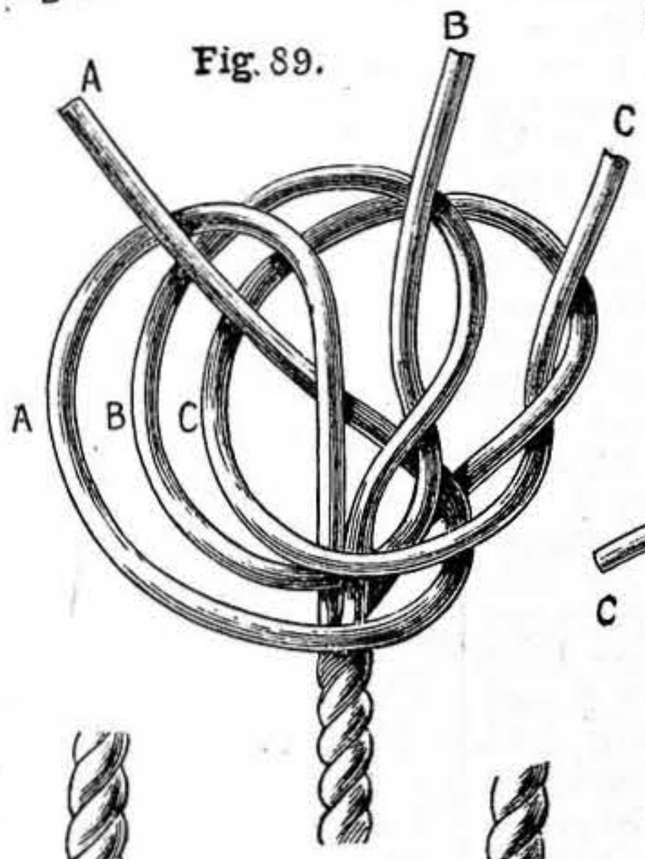

Fig. 89.

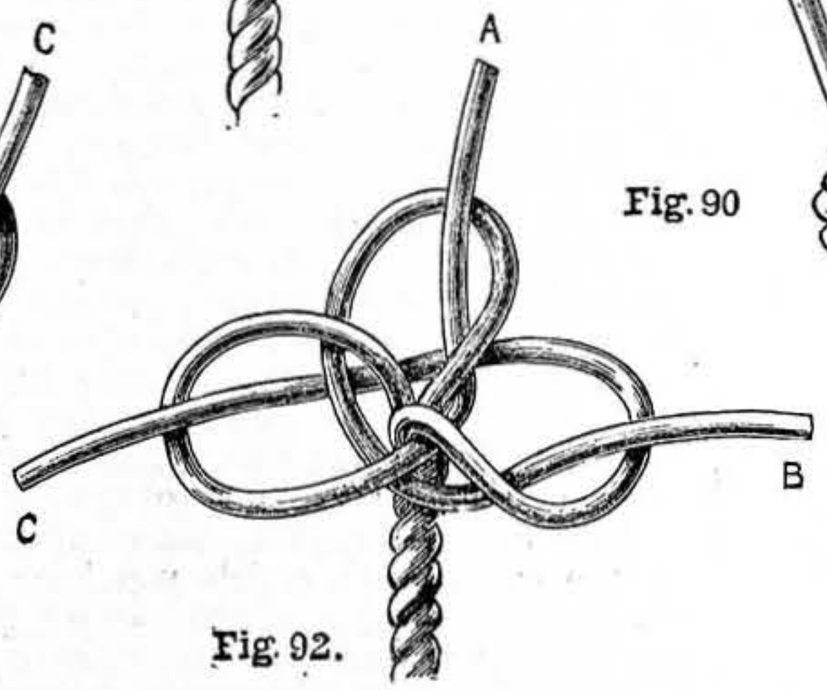

Fig. 92.

Fig. 90

Fig 88.

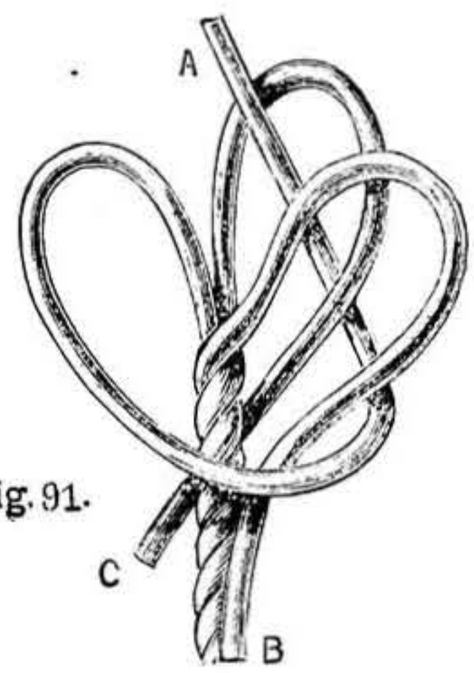

Fig. 91.

Fig 93.

Fig. 94.

Fig. 95.

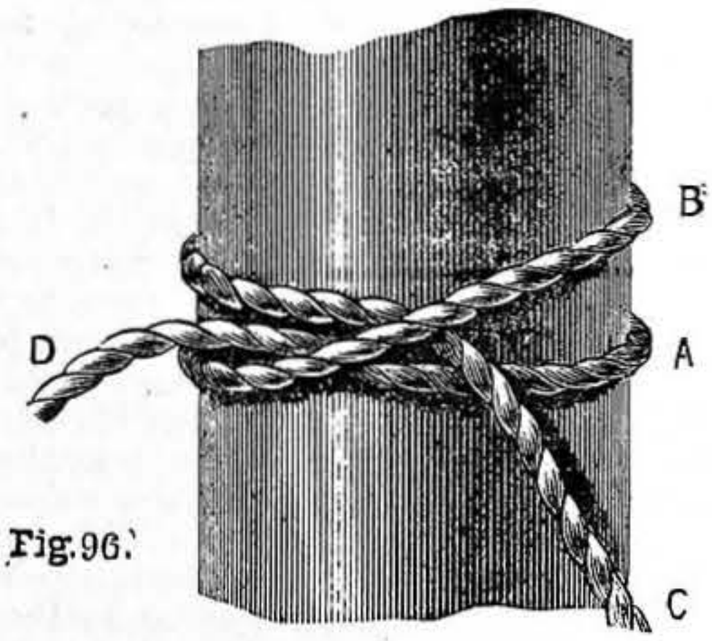

Fig. 96.

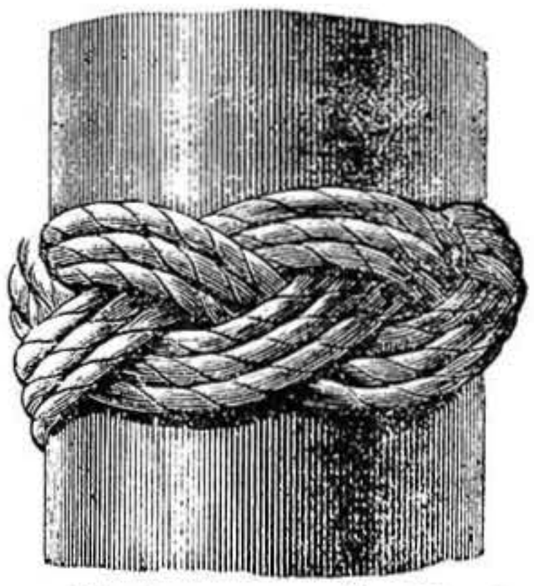

Fig. 97.

Fig. 82.—Wall Knot. Fig. 83.—Stopper Knot. Fig. 84.—Crowning commenced. Fig. 85.—Crowning. Fig. 86.—Manrope Knot commenced. Fig. 87.—Manrope Knot. Fig. 88.—Tack Knot. Fig. 89.—Matthew Walker Knot commenced. Fig. 90.—Matthew Walker Knot. Figs. 91, 92.—Single Diamond Knot commenced. Fig. 93.—Single Diamond Knot. Fig. 94.—Double Diamond Knot. Fig. 95.—Shroud Knot. Fig. 96.—Turk's Head commenced. Fig. 97.—Turk's Head.

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to unlay the rope considerably more than is required for the preceding knots. To form a diamond, bring each of the three strands down alongside the standing part of the rope, thus forming three bights, and hold them thus with the left hand. Take the first strand, A (Fig. 91), and putting it over the next, B, bring it up through the bight of the third strand, C. Take the end of the second strand over the third and up through the bight of the first. The last strand is brought over the first and up through the bight of the second. Haul taut and lay the rope up again. Fig. 91 is the way the knot is begun, showing the manner of taking the first strand. Fig. 92 shows the loops in their places with the ends through them before they are hauled taut. Fig. 93 gives the knot finished. This is a difficult knot to illustrate and describe; but the key to the knot is to remember that, after the bights are formed down the standing part, each end successively goes over the strand next to it and up through the loop beyond. This knot is the "Single Diamond." For a "Double Diamond" (Fig. 94) we make a "Single Diamond," as above, without laying up the strands; the ends are then made to follow the lead of the single knot through two single bights, the ends coming out on the top of the knot. The last strand passes through two double bights. When the ends are hauled taut they are laid up as before. The last four knots are used for the ends of lanyards, man and ridge ropes, yoke lines, etc.

The "Shroud Knot" (Fig. 95) is a very valuable knot for joining two ropes together; it is used for joining a stay or shroud that has been carried away. The ends of each rope are unlaid, and they are then placed within one another as in splicing, the parts not unlaid being brought closely together. Make a "Wall Knot" with the strands of one rope round the standing part of the other rope; turn the ropes over, and do the same with the other set of ends, and they will appear as in the figure. Open the strands, and taper and serve them over if you wish to make a particularly neat job of the work. Two ropes of different sizes may be twisted in this way, and will be quite secure.

"French Shroud Knot." In making this knot, unlay the ends and place the two ropes with the strands intermixed as before; bring one set of ends back on their own rope, and make a single "Wall Knot" with the other set of strands round the bights of the first set and the standing part. They can then be tapered and served as in an ordinary "Shroud Knot."

"Spritsail Sheet Knot." Unlay the two ends of a rope and bring the two sets of strands together side by side; these have to be walled together in precisely the same manner as a common "Wall Knot." A bight is made with the first strand, the second is put over the first, the third over the second, the fourth over the third, the fifth over the fourth, the sixth over the fifth and through the bight of the first; they are then hauled taut. It may be crowned by laying two of the strands along the top of the knot and passing the other strands alternately over and under these two, and afterwards hauling them taut. It may be double-walled after crowning by putting the strands successively under the bights on the left of them and through the same bights, and the ends will then come up in the right position to be crowned again. This is done by following the lead of the first crowning and putting the ends through the walling as before.

"Buoy Rope Knot." This can only be made on a cable-laid rope. Unlay the main strands, and take out one of the smaller strands, of which they are composed, from each of the large strands, and then lay them up again. The small strands that have been taken out are now single and double-walled round the rope, and then laid along the divisions after the manner of weaving, and their thin ends stopped with spun-yarn. A stop should be put round the rope with the spun-yarn where the knot is to be made before it is commenced, and the walling should be made right-handed.

"Turk's Head" is a highly ornamental knot of quite a different character to the preceding ones, inasmuch as, instead of being made out of the rope itself, it is formed on the rope with a piece of small stuff worked round it. A "Clove Hitch" is first made on the rope (Fig. 96); this must be slack enough to allow of the extra strands which will form part of it. Put part A over strand B, thus twisting the two strands; pass the end C under and up through the bight that B now forms, then twist again by putting B over A and run the end under and up through the bight of A. Continue twisting the strands by alternately putting one over the other, and at each twist bring the end under and up through the bight which is underneath, A at the commencement going over B; the bight which B makes will be the under one, and therefore the one through which the end C must be passed. The end C must be very much longer than shown as the whole knot is made with this part, and as the knot when finished contains three groups of three strands each, it is obvious that the length of cord used must be more than nine times the circumference of the rope round which the knot is made. Having made a sufficient number of twists (the number depends on the size of the knot), lay the end C, with which you have been working, alongside D, where it comes out of the knot, and continue following its lead through all its turns as it goes through the knot until you come round to the commencement again. There will now be a "Turk's Head" of two parts. If the end is again passed through by the side of the same strand as before, a complete "Turk's Head" of three parts will be formed. Care must be taken to keep the strand with which we are working close to and on the same side of the strand we are following, or a perfect knot cannot be formed. The first time round is the most difficult, the second is easy enough. Of course, the knot may consist of more parts if required, but three are the usual number. Fig. 97 gives the finished knot. The ends do not require fastening in any way, as in the last round they finish in the middle of the knot under the coils, and are quite secure.

A SADDLER'S CLAMP.

BY OPIFEX.

CLAMP NECESSARY—MATERIALS—CONSTRUCTION—STAVES—LOWER PIECE—PUTTING TOGETHER.

OF all amateur workers, the amateur saddler is most easily furnished with "a kit": a ball of hemp, a lump of cobbler's wax, a few needles, and an awl. With the aid of these and a bit of leather many odd jobs may be done; and if the "stitch in time" be seen to, not only will the proverbial "nine" be saved, but many a broken bone as well.

But although an odd job may be *done* with the appliances mentioned, it cannot be *well* done with these alone, and no good mend, etc., can be accomplished without the assistance of the article illustrated in Fig 1, which I have called "a clamp," but am not certain whether it should be styled a "*pair* of clamps," or, indeed, clamp at all, for in my country it is called a "clams." But "what's in a name?" The chief thing is to have it and know its use; and therefore deprecating the scorn of those who possess the article, or a better, I address myself to any of my readers who may desire to possess it, describing in as few words as possible how I made mine many years ago.

Materials.—The parts A and B (Fig. 1) are made from two oak barrel-staves—in my case part of an old sugar hogshead—but the staves of a petroleum cask will suit admirably, and I believe the old sugar hogshead is a thing of the past.

Should neither of these, however, be available, some friendly cooper may be found who will, for a small consideration, supply a couple of suitable staves.

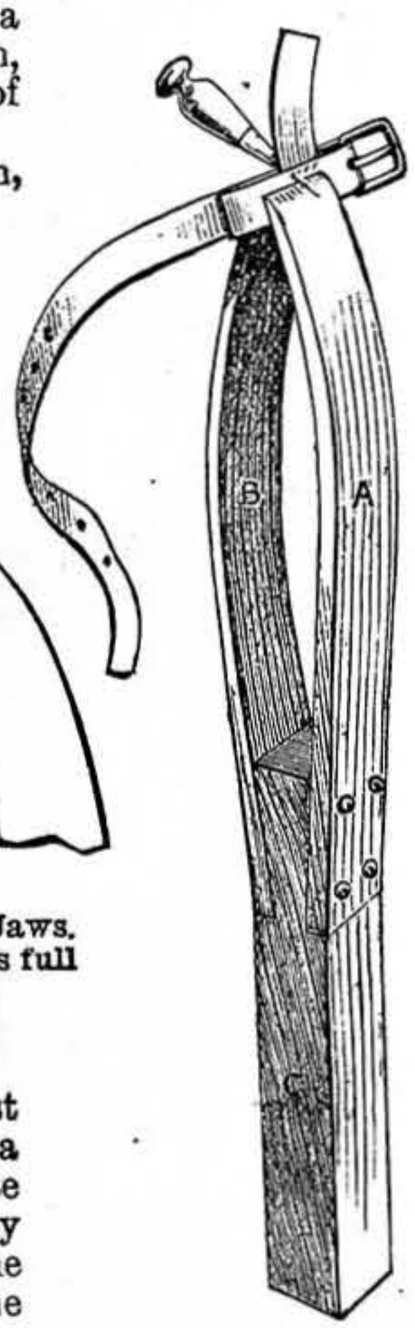

Fig. 1.—Sketch of Clamp. (Scale, 2 in. to 1 ft.)

Fig. 2.—Sketch of Jaws. (Scale, two-thirds full size.)

The lower portion, C, may be of almost any kind of wood—a sound piece of white deal, 20 in. by 3 in. by 3 in., will answer the purpose well, and the only other requisites will be eight stout 2¼ in. screws.

Construction.—Having selected two sound staves, they should be cut 2 ft. long by at least 3 in. wide, the points of greatest convexity being in the centre. And here I may mention that the more bent the staves are the more useful will the clamp be.

Clean up the outside with a spokeshave, leaving one end the full thickness of the staves, or about an inch, and thinning off gradually to about ¾ in. towards the upper ends, which are to form the jaws of the clamp. Round off the outer corners in their full length, bearing in mind that the clamp is firmly grasped between the legs when in use, and clean up the inside surface flat, smoothing both sides with glass-paper.

We now turn our attention to the lower part, C.

The dovetail-shaped tenon, which should be at least 6 in. in length, will require careful cutting, the depth of the shoulders and also the width of the upper end depending upon the amount of curve in the staves which are to be attached to it: but if the worker bears in mind that his object is to firmly embed the staves so that their upper ends, or the jaws of the tool, shall press

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tightly together, no difficulty will be encountered.

With this object the tenon should be cut, so that energetic screwing will be required to bring the staves home into their final position.

The positions of the screws, which should be countersunk flush with the surface of the staves, are indicated in the drawing, and Fig. 2 (two-thirds size) shows the shape of the jaws.

OVAL AND CYLINDRICAL VESSELS IN SHEET METAL WORK.

BY R. ALEXANDER.

WATER POTS—BOILER FILLERS AND TOILET CANS (*continued*)—HOW TO CUT OUT, MAKE AND FIT THE TOPS AND SMALL WORK, SPOUTS, ROSES, ETC.

The Tops.—Boiler fillers and water-pot tops are both made in the same manner. To make the pattern, Fig. 1, set the compasses to such a radius as will give a circle about ⅜ larger all round than the outside of the wire of the tops.

Describe a circle, and from any part of its circumference, A, with the same radius describe the arc, B C. This is the geometrical pattern, but as is very often the case with patterns geometrically true, there has to be a little allowance made for hollowing up. It is found in hollowing up that the points B and C draw up, and if no extra allowance were made the top would be too small, or it would have to be pressed down very much at that part and would look "squatty," so a gentle curve can be drawn as shown by the dotted lines—about ⅛ of an inch each side at the widest part will be sufficient. Allowance must also be made of ⅜ inch inside the curve, B C (also shown by dotted lines), for wiring; notches must also be cut across the points B and C as shown. The tops are hollowed much the same as a saucepan cover, which they practically are, with a segment cut out; the large block hammer must be freely used along the cut-out part or it will pucker very much; they will be found rather more difficult to hollow than saucepan covers, but a little practice will overcome any difficulty that may be experienced. Crease the tops for wiring in a swage or on the crease iron with a creasing hammer, and wire with a small wire on the edge of the crease iron. I generally use a hammer for putting the wires in these tops, and after wiring, hammer the wiring through the same crease that the tops were creased in, using a rounding faced hammer. Swage or crease round the other part to fit the wiring of the bodies, and fit on. Take care to get the points of the top equidistant from the seams by making marks with the compasses the proper distances from each seam, and setting the points of the tops to them. Tack the top in three or four places and solder round.

Tops of Toilet and Hot-water Cans.—These are flat with a hinged cover; the top will require a little explanation. When wired and fitted to the can it covers somewhat more than half of the can (*see* Fig. 2). Mark out first a facsimile of the bottom pattern, draw a line across the middle, A B, and two inches from that draw a second line and cut across. The reason so much has to be allowed beyond the centre is because the bosses (shown by the shaded parts on line A B) will come ½ to ⅝ in. beyond the centre, and 1¼ in. has to be allowed for wiring and turning back, which I will now describe.

The top being cut out as Fig. 3, cut four slits at distances shown, and 1 in. in length (these ¾ wide pieces can, when wired, form the hinges); fold the edge and wire, sink the wire and make a mark with the compasses ¼ in. to ⅜ in. clear of the wire, and double back on the hatchet and flatten down on the crease iron. Hold the tops in the vice, and, with a small file, file the ¾ pieces till they part from the top; they will then work on the wire and may be used as hinges, or they may be taken out and longer pieces put in, which is usually the case in best work where the covers are riveted on. Another way of forming the hinges is to notch the covers (Fig. 4), and make the hinges on them, and rivet or solder to the top. Fold the edge over to fit the cans; this is done partly with the jenny, and partly with the half-moon stake, and requires care.

The covers must next be made if they are to be riveted on, as that cannot be done after the tops are soldered on. It is not a hard matter to cut out a pattern for the covers. Place a top on a can temporarily and measure the distance between the wire and the edge of the can, as from X to X, Fig. 2. Mark out a top from the pattern you have and take a section of it, allowing ½ in. more than the measure just alluded to, and about ⅛ round the D part; this will allow for wiring. Cut a cover out by this, wire it all round and see how it fits, and correct pattern accordingly. The wire in the covers is sunk by running it through the jenny; tack the covers to the tops and rivet. The tops and covers can then be fitted to the cans. The handles can next be made and fitted. The back handles have already been mentioned, and I will now describe the cross handles. A good rule for the length to cut them is to take half the circumference of the body; thus, if two singles were used for the body, the handles would require to be cut the length of a single plate (14 in.). As to width, six out of a plate will do for water pots, and a little narrower for toilet cans; cut them the shape shown (Fig. 5); then cut off a good notch of the right shape, which is important, especially for toilet cans. Fig. 6 shows a full-size end of a cross handle, with A, a properly cut notch, and B, an improperly cut one. Anyone can see that when folded and wired the notch B would be practically gone, whereas A would then have as much left as there shows of B before wiring. The reason a long notch is wanted is so that the ends of the handle can be creased like the example (Fig. 7), which also shows the proper shape of the handle. They are fitted with a boss in the centre before being fixed to the can. Fig. 8 is the flat pattern drawn with compasses set to the sweep of the handle in the centre, which is the same as the ends of can. The handles can then be tacked on and the side bosses soldered on. Fig. 9 is the flat pattern of them; they are bent on the extinguisher stake, and should be soldered on strongly, as they are the principal stays of the can. Water-pot handles are fixed in a different manner. Mark on the top the place for the handle, and with a sharp chisel cut a slot the width of the handle just in the crease of the top; slip the handle down an inch each side and solder. The ends of the handle should be bent towards the body of the can before being put through (*see* Fig. 10, which is a section of handle and body, showing more clearly the method of fixing). Two stays which are made by turning narrow strips of tin on a piece of ¼ rod in the crease iron are next put on. Each end is flattened so that the seam comes underneath, and is soldered to handle and can, as shown at S, Fig. 10. Boiler filler handles the same way, except flat topped ones, which are put on like toilet cans and with side bosses; some hollow topped ones have side bosses, but most have the ordinary stays. The next consideration is the spouts. Fig. 11 shows the flat pattern for toilet cans and fillers; the top part, B, will form the nozzle, the seam of the spout will be uppermost, and the seam of the nozzle underneath; a little more lap must be given to the seam than to the nozzle, or it will not be large enough. It is as well to make a pattern slightly larger than the one derived by cutting the spout pattern as shown.* A water-pot spout would simply be a continuation of Fig. 11, and cut plain across at the end.

Bosses and Stays.—Toilet cans and boiler fillers have a boss between the spout and body. Fig. 12 is the pattern for it; it is bent on the bick iron across the dotted line; the straight part goes to the body, and the bevelled side down the sides of the spout. Water pots have simply a bridge and two stays similar to those for the cross handles. The bridge is a slightly tapering piece of tin turned half round and soldered, about 1 in. below the top and reaching to the spout; the stays are fixed level with it.

Position of Spouts.—Spouts should be made and fixed so that the bottom part of the outlet in toilet cans and fillers is a little above the level of the top of the can body, so that the water will not run out when they are filled; water pots some inches longer.

Water-pot Roses.—The ordinary rose is made in three pieces—socket, funnel or cone, and front. Two flat patterns only need be made—viz., the cone and the socket. The size of the front when ascertained by experiment can be marked on the cone pattern. The socket will of course require to be exactly the same degree of taper that the spout is; it can therefore be marked out from the top portion of the spout, varying in length according to the size of the can. The larger end of the socket is notched for folding; it is not wired, but simply flattened down. Turn round on the bick iron and fit on to the spouts, and solder the seams; fit them so that they slip on the spout about half their length. Care must be taken to get both spouts and sockets quite round, or the water will come out very much where the socket fits on. To assist in gaining a good fit the sockets should not be made of too stiff a material. The cone pattern (Fig. 13) next demands our attention. A look at the pattern will show that it is a circle with a portion cut away. On how much is cut out depends the shape of it. If only a small portion out of a circle of, say, 5 in. diameter is cut away, it will be a very flat cone, and if a large portion, say half, it would be a higher cone, but lessened in diameter. I shall give in a future paper full instructions for setting out cones of all shapes, but for the present example a very simple rule will suffice. Set the compasses to a radius of 1 in. less than the diameter of the rose required, describe a circle, and divide it into six parts. Mark two of them out by drawing lines from 1 and 5 to the centre, set the compasses to two-thirds the diameter of the sockets, and describe another small circle; allow ¼ in. on one side

* The ends of the nozzles of toilet cans and boiler fillers are either wired or false wired.

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for soldering, and cut out. This gives the correct shape for water-pot roses. If wanted more conical, set the compasses the full diameter of the front required and take half of the circle so described; but this is what we term funnel shape, as it is almost an invariable rule to cut funnels a semi-circle. There are several ways of fitting the front of the roses to the cones; two of the most used methods are shown in section at Fig. 14, A and B. In method A the cone is soldered up and the front hollowed, pierced, and the edge "took up," slipped on, and soldered round. But the best and, I think, the most workmanlike way is method B, though it is a little more trouble. It is done as follows: instead of soldering the seam of cone all the way along, simply tack it with a dab of solder in the middle, and throw back an edge similar to the first edge thrown off on a saucepan cover (*see* article in Vol. II., page 661); then turn up a similar edge to lap over the front of the rose, measure across the cone, and cut out the fronts, allowing a little for hollowing. Before hollowing, describe concentric circles as a guide to punching the holes (Fig. 15); hollow up like a tea-kettle cover. Next punch the holes with a round-pointed bradawl on a piece of wood. This is for ordinary water pots. For water pots requiring roses with fine holes a very small punch is used and the holes flattened down; the fronts of these are usually made of copper. Now untack the cones and slip the fronts in, and draw the cones together again and tack. If the fronts are too large they must be trimmed round. The edge is next flattened down by going round it on the half-moon stake with a hammer about twice; it need not be soldered round afterwards, except where the seam meets the front. The sockets can then be soldered in. They can be put in either upright, as A, Fig. 14, or at an angle, as B, Fig. 14, which is the most usual method. To allow this a little must be cut out of the top of the cone on the seam side; solder round the socket and up the seam of the cone and the article is completed, with the exception of studs on the bottom, of which it is usual to put three on water pots and four on toilet cans. I omitted to state, though it was hardly necessary, that small handles must be put on the covers of toilet cans.

There are other varieties of cans, as I before stated, but the reader will easily comprehend their make and shape on seeing them, and find that the instructions given for those that I have described will enable him to make them with very little difficulty. For instance, a strawberry pot is a very shallow can *without* a cross handle and with a very long spout, small at the end and without a rose. A beer can such as is taken out into the brickfields and hop gardens in Kent is made the same as a toilet can, with the exception that it is round instead of oval, and the spout is very small

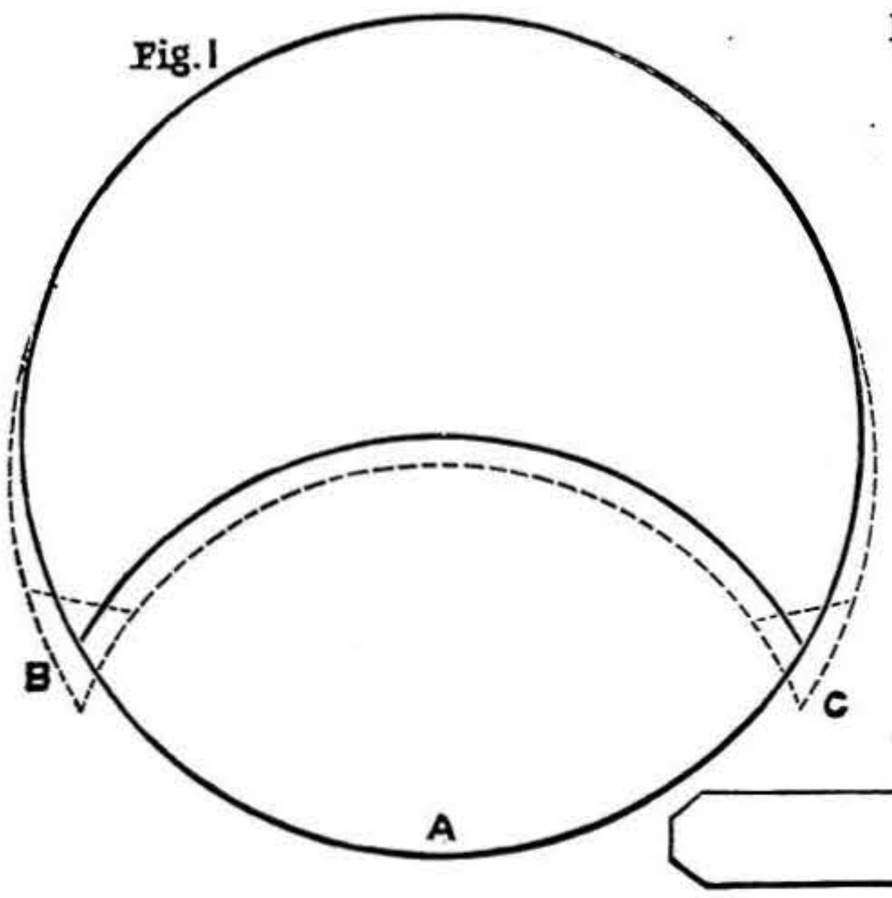
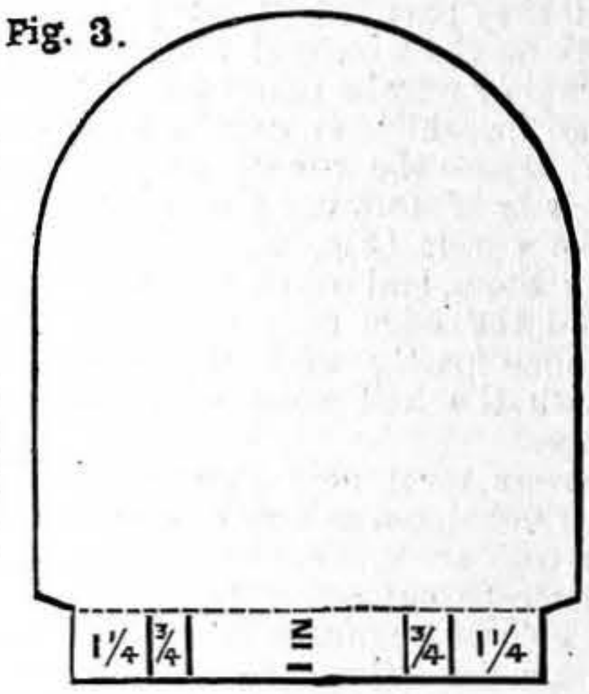


Fig. 1.



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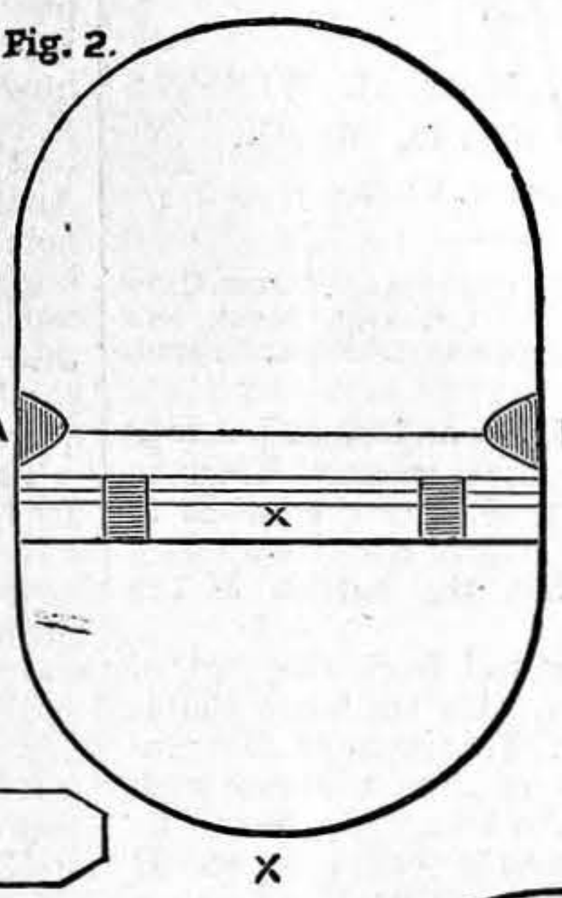

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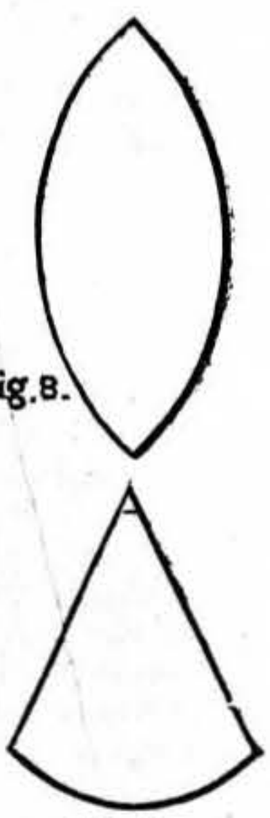
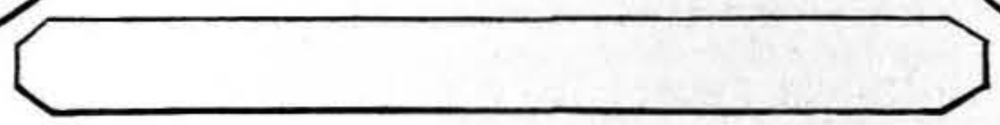


Fig. 8.

Fig. 9.



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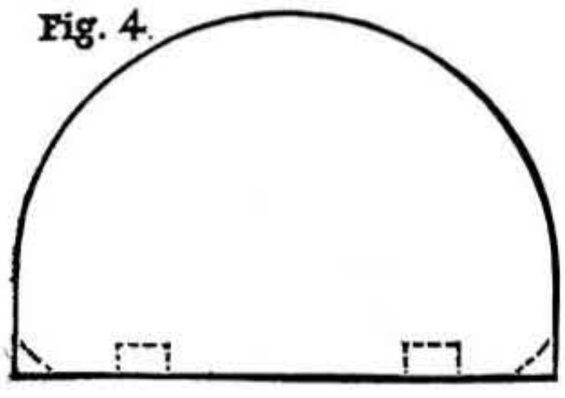

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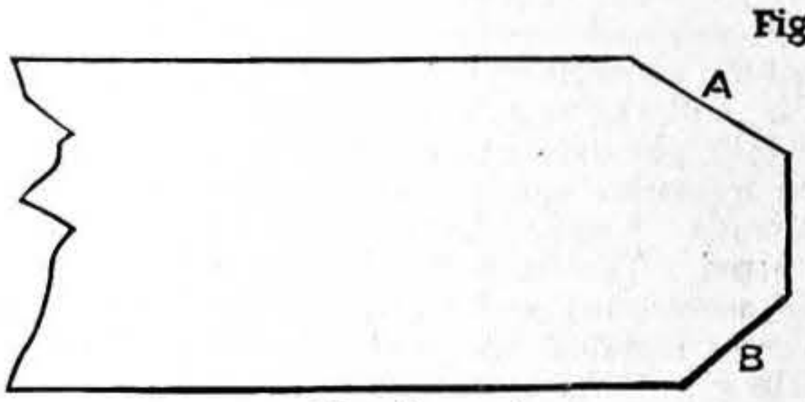


Fig. 6

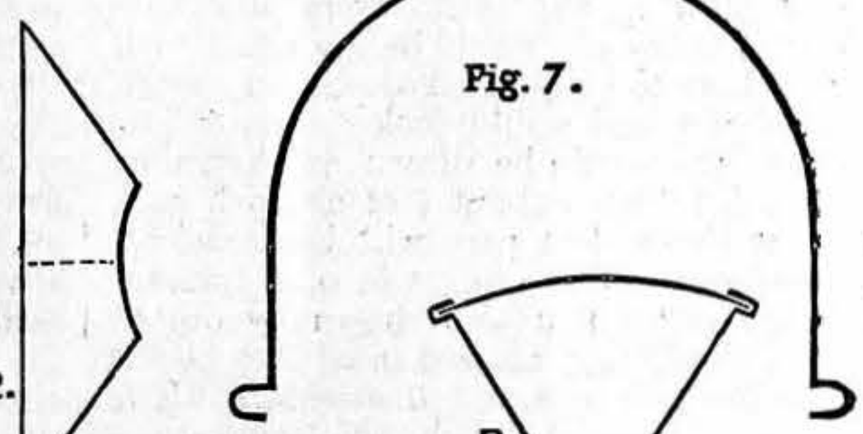


Fig. 7.

Fig. 12.

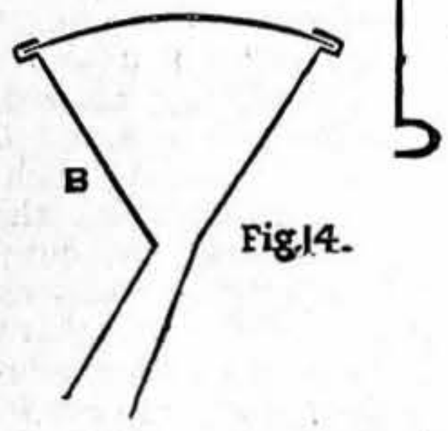


Fig. 14.

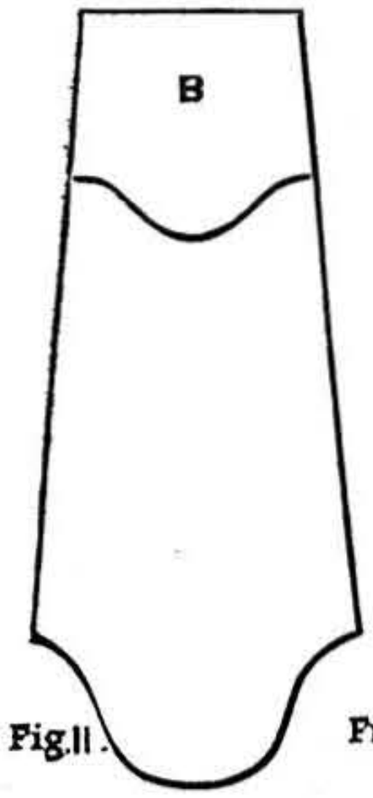
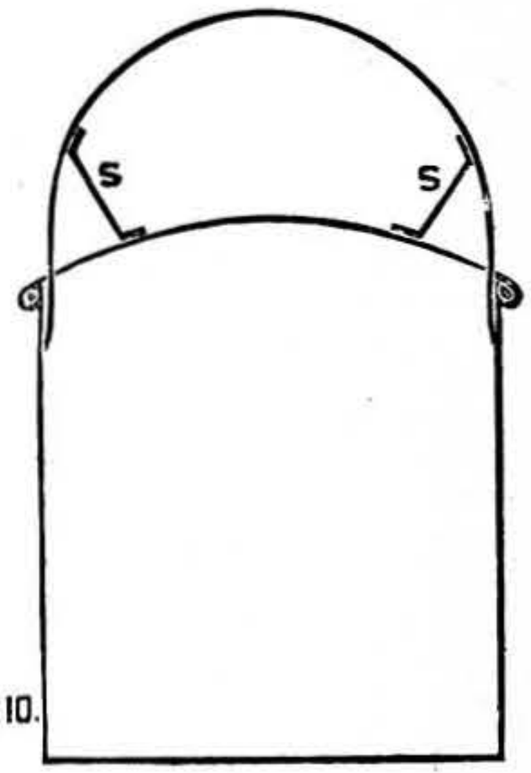


Fig. 11.



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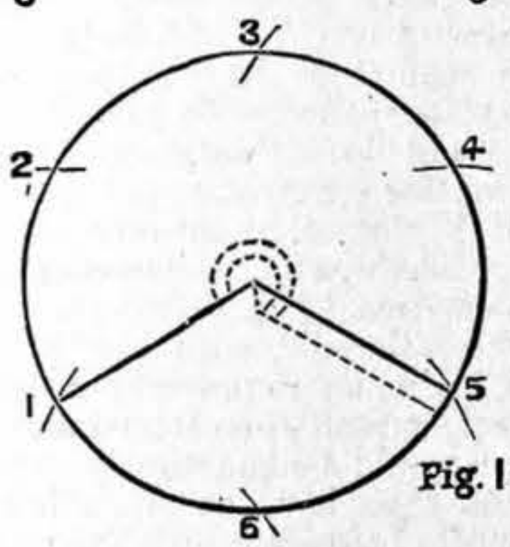
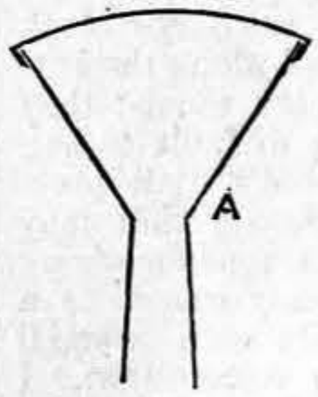
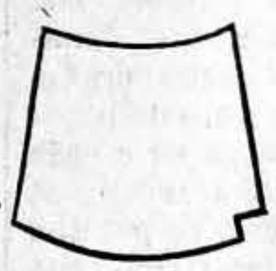


Fig. 13.





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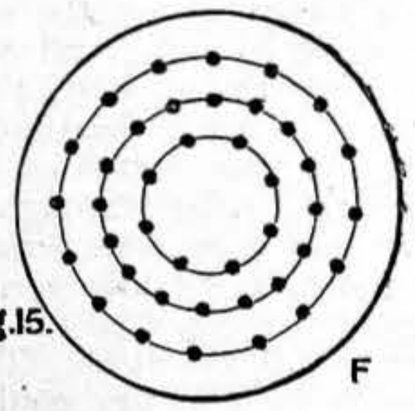

Fig. 15.

Fig. 17.

Fig. 1.—Pattern of Water Pot and Boiler Filler Top. Fig. 2.—Toilet and Hot-water Can Top. Fig. 3.—Details of Ditto. Fig. 4.—Toilet-can Cover. Fig. 5.—Cross Handle. Fig. 6.—Enlarged Section of Ditto, showing Notching, Correct (A) and Incorrect (B). Fig. 7.—Shape of Handle, showing Crease to fit Top. Fig. 8.—Boss Pattern. Fig. 9.—Side Boss Pattern. Fig. 10.—Section of Water Pot, showing Method of fixing Handle. Fig. 11.—Spout Pattern. Fig. 12.—Toilet-can Bridge. Fig. 13.—Cone Pattern of Rose of Water Pot. Fig. 14.—A and B, Sections of Roses. Fig. 15.—Rose Front, showing Holes. Fig. 16.—Pattern of Socket of Rose. Fig. 17.—Pattern of Bridge of Water Pot.

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at the nozzle. Thus each article described will show the intelligent workman how, by slight modification of pattern, etc., he can make other articles of a similar class, but differing slightly in detail.

I earnestly trust that the description I have given above, and in the preceding paper, of the method of dealing with oval and cylindrical vessels in sheet metal when making them will be intelligible to all who read it. That it will be so to the young professional reader I do not doubt, because it will be, if it is not so already, his every-day work, and he will have had opportunities of seeing it done by others, even if he has not done it himself. To such as these I hope my papers will be useful in showing them the why and the wherefore of the process to be followed in each stage of the making, from beginning to finish. If any amateur sheet metal worker finds anything that is not clear to him, I shall always be ready to help him through his difficulty in "Shop."

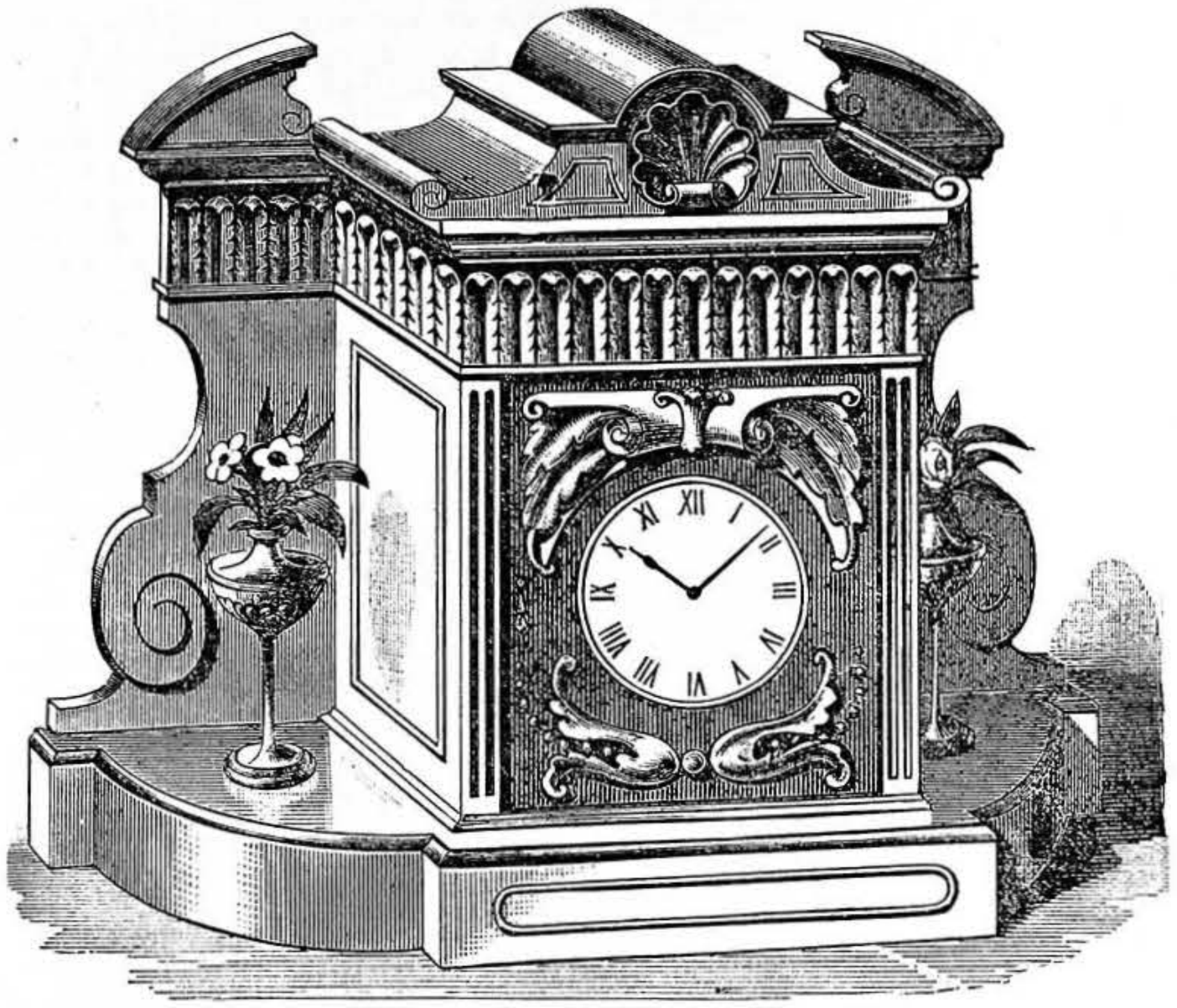


Fig. 1.—Perspective View of Case for Drum Clock.

A CARVED CASE FOR A SMALL DRUM CLOCK.

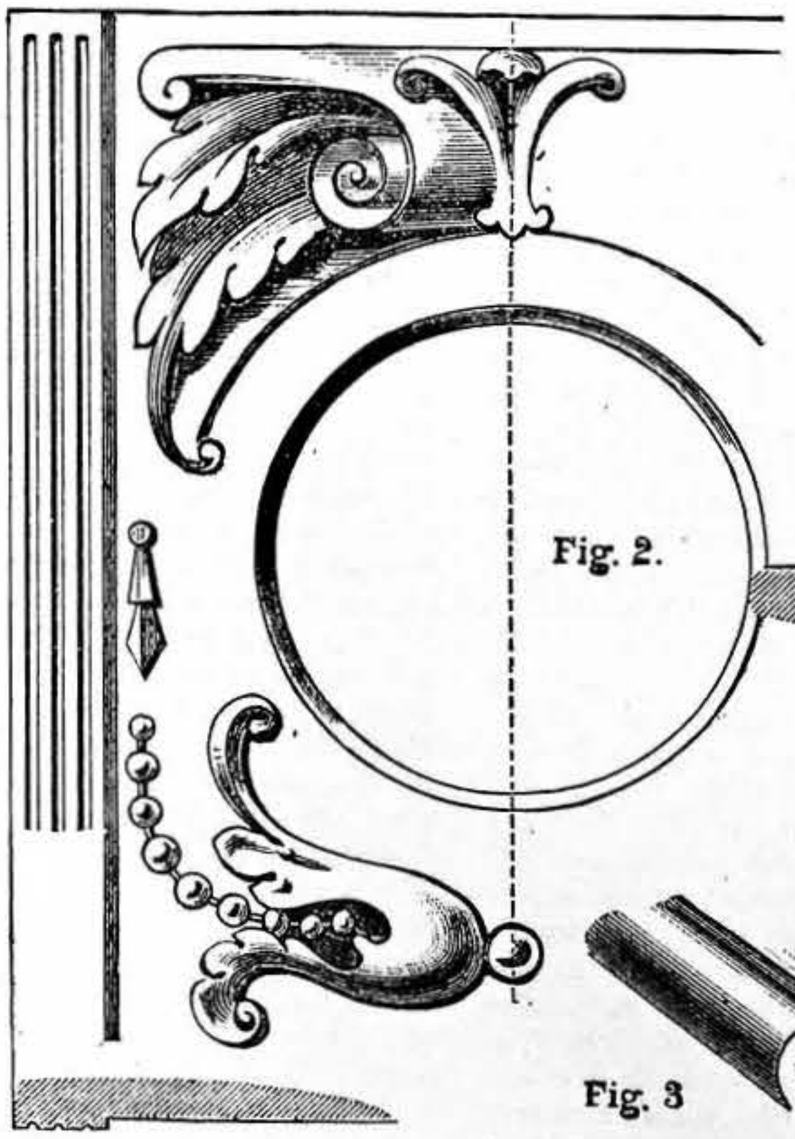
DESIGNED BY F. FAULDING.

REMARKS ON DETAILS—FRONT—PEDIMENT—PLINTH—POSITION OF CLOCK—CLAMPING DOOR—NOVELTY OF DESIGN—MODIFICATIONS OF DESIGN AS GIVEN—MATERIAL AND ORNAMENTATION—SUBSTITUTE FOR PEDIMENTS.

THE accompanying design, exhibited in Fig. 1, is the perspective view of a carved case for a small drum clock. The details are shown on a somewhat larger scale in the remaining illustrations, of which Fig. 2 gives the carving for the front in which the drum is fitted, the half on the left-hand side of the centre line being shown; and in point of fact this is, or ought to be, sufficient for the wood carver, as the carving on the right-hand side is merely that on the left reversed. Fig. 3 supplies the details of the pediment placed on top of clock-case above the cornice, which is shown in Fig. 4. The plinth is shown in Fig. 5, and it will be noted that in this, as well as in Figs. 2, 3, 4, a section of the work is indicated. This is helpful in supplying a guide to the depth of the carving. The clock is placed in position in the circular opening cut in the front to receive it, through a small door attached to the case by hinges, and forming, indeed, the entire back of the case, framing excepted, which is formed by the case itself. The mode of carrying this out will be so obvious to anyone who is accustomed to do a little cabinet making, that it is unnecessary to go at length into the details of the construction. It will be sufficient to say that the back of the case should be flush with the outer surface of the door, and that the door itself should close against narrow strips placed within the case at sides, top, and bottom, at a distance from the edge of the opening exactly equal to the thickness of the door. If the workman be equal to the task, it will be better to clamp the door at the top and bottom, the grain running in a vertical direction, in order to prevent warping. If the door is not clamped, the better way will be to make it of two thicknesses of wood glued together, the grain of the outside piece running vertically and that of the inside piece horizontally. When made of a single thickness, even hard wood is apt to warp or buckle slightly, especially when the clock stands on a mantel-piece over the fire, and is thereby exposed to variations of temperature. When the door is made of a single thickness, the wood should be $\frac{3}{8}$ in. thick, but if of two thicknesses, each piece should be no more than $\frac{3}{16}$ in. thick.

Recurring for a moment to the design in Fig. 1, the novelty in it may be said to be the carved wings by which the case is flanked at the back, and the extension of the plinth in such a manner that it affords standing-room for two small glasses intended for the reception of single flowers, or, at the utmost, from two to four of the same kind, if not too large. Further, the plinth may be made sufficiently large to receive two tiny candlesticks, in the sockets of which may be placed two small petroleum lamps. This is frequently done now, lamps being made and sold for the purpose; and the effect produced is certainly pleasing, the candlestick and the lamp together forming a small pedestal lamp. The candlesticks may be of blue and white earthenware, silver, or brass; and if the maker of the case be a turner, he may make them of wood, or even of ivory if he cares to go to the expense.

The design may be carried out as drawn, or it may be modified in many particulars. For example, the wings and the extension of the plinth may be dispensed with, and the central part only be utilised as a case. Another modification may be effected by omitting the pediment above the cornice; but if this be done, it will be as well to make the top perfectly flat, so as to form a resting place for a small bronze figure. If this be done, it will be desirable to introduce another member in the form of a flat piece of wood with a moulded edge, between the top of the plinth and the bottom of the case proper of the clock; and, indeed, looking once more at the design in Fig. 1, it would be an improvement to add this feature, so that the ornamental vases, etc., at the side would stand on a lower



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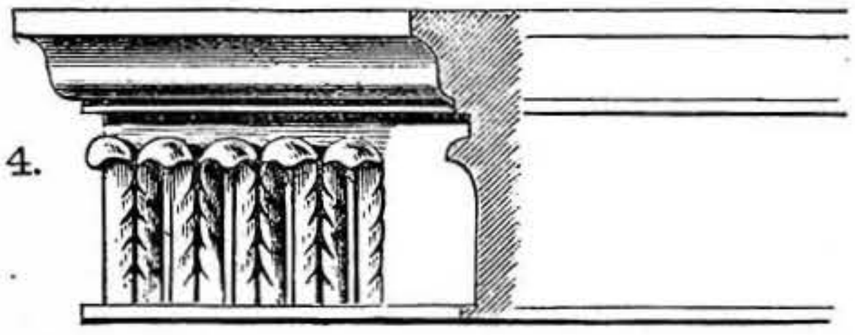

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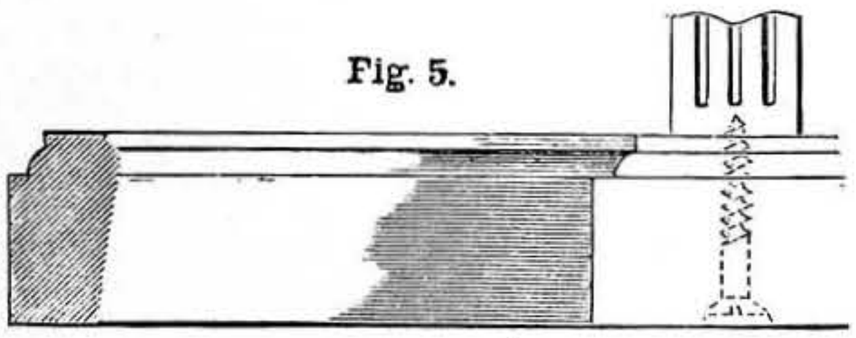

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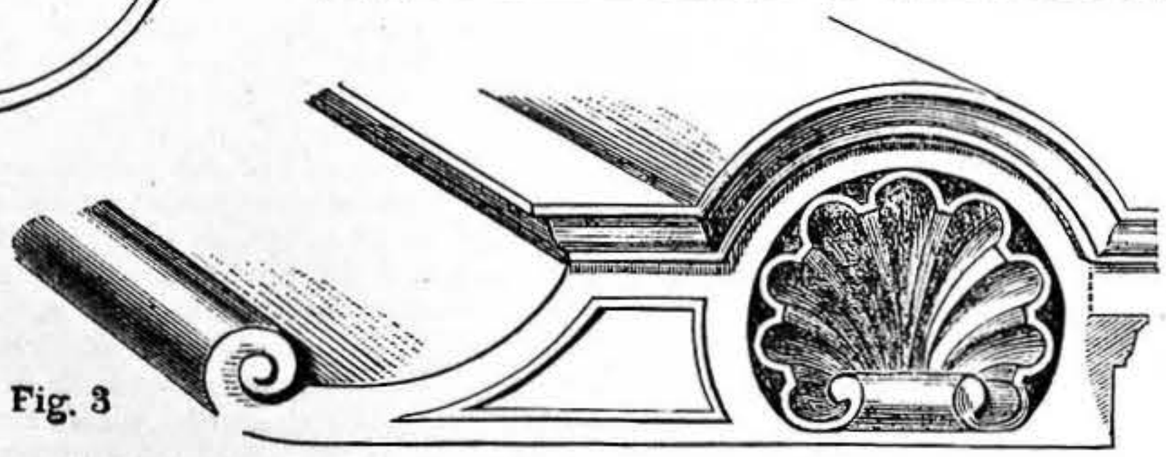

Fig. 3

Fig. 2.—Details of Carving for Front, Left Side. Fig. 3.—Details of Pediment at Top of Clock-case. Fig. 4.—Enlarged View of Cornice at Top of Case. Fig. 5.—Plinth at Base of Case, showing Section.

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level than the casing of the clock that is placed between them.

The material used may be walnut or any hard wood. If made in ebonised wood, with incised gold lines on the plinth, as shown in the design, and with the panels on the sides of the case defined in the same manner, a pleasing effect would be obtained. It may be suggested, too, that if the central case only were used, without the pediment, it would be as well to add a flat piece of wood on the top, with the edge moulded in the form of a quarter circle in section, and from ¼ in. to ½ in. less than the top of the clock-case on all sides, the back excepted.

HOW TO SHARPEN A SCRAPER.

BY CHOPSTICK.

I AM often surprised to see a man taking a great deal of pains to plane up a cross-grained piece of wood, setting the plane as fine as possible, and turning the wood this way and that way; and after trying in vain to get a passable face on it, he tries first coarse glass-paper, then finer, until he does get a decent face on it—but by what a method? Decidedly amateurish, I think. Now, if that man would only use that very useful though simple tool, the scraper, he would do his work quicker and far better.

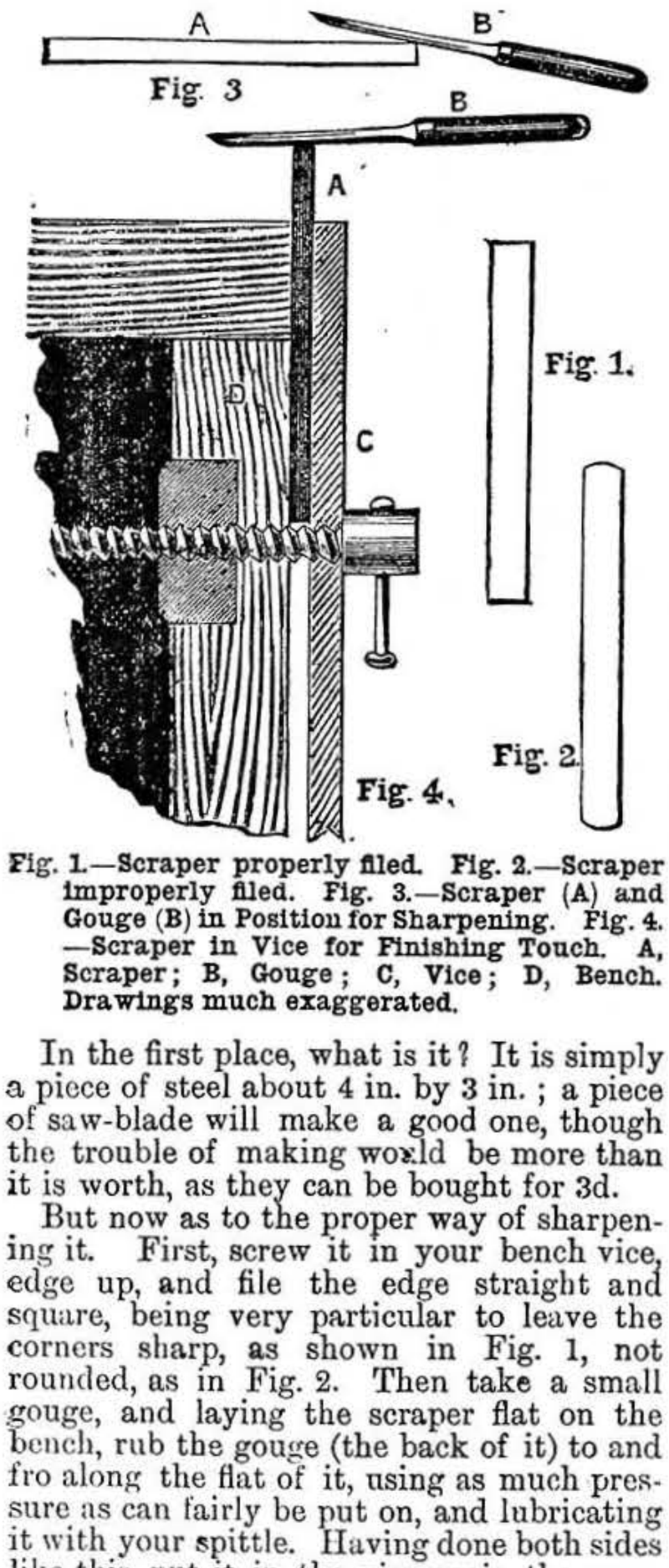

Fig. 3

Fig. 1.

Fig. 2.

Fig. 4.

Fig. 1.—Scraper properly filed. Fig. 2.—Scraper improperly filed. Fig. 3.—Scraper (A) and Gouge (B) in Position for Sharpening. Fig. 4.—Scraper in Vice for Finishing Touch. A, Scraper; B, Gouge; C, Vice; D, Bench. Drawings much exaggerated.

In the first place, what is it? It is simply a piece of steel about 4 in. by 3 in.; a piece of saw-blade will make a good one, though the trouble of making would be more than it is worth, as they can be bought for 3d.

But now as to the proper way of sharpening it. First, screw it in your bench vice, edge up, and file the edge straight and square, being very particular to leave the corners sharp, as shown in Fig. 1, not rounded, as in Fig. 2. Then take a small gouge, and laying the scraper flat on the bench, rub the gouge (the back of it) to and fro along the flat of it, using as much pressure as can fairly be put on, and lubricating it with your spittle. Having done both sides like this, put it in the vice again the same as before, and taking gouge again, run it smoothly along the edge of the scraper with a hard, even pressure three or four times. You will then have two cutting edges, and if properly done you can take off shavings the whole width of the scraper and of a beautiful fine texture, leaving a splendid face on the most difficult working wood, which will only require a rub with the finest glass-paper to be ready for polishing.

In one shop where I was working a few months ago we made a great many first-class coffins, both oak and pitch pine, which all had to be French polished, and we scarcely used a smoothing-plane to any of them, simply taking out the saw-cuts with the jack-plane, and finishing with the scraper. Until that time I had been in the habit of planing, but I have altered my mind, and all the work I now do is finished with the scraper. One more word before I finish, and that is, do not attempt to scrape pine or deal, as it is too soft; but any hard wood it will do to perfection.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

68.—THE PERFECTED AUTOMATIC HAND CAMERA.

MESSRS. TALBOT & EAMER, manufacturers and dealers in all kinds of photographic apparatus, write to remind me that about eighteen months ago I noticed their Diamond camera in WORK, and that they have now "introduced a new camera, which has features not possessed, either together or separately, in any one of all the similar instruments in the market." Further, they enclose a few particulars and some specimens of its work, and express their willingness to forward fuller particulars. I would much rather that all inventors, patentees, and sellers who wish for a notice of their specialities in WORK would send a specimen of the camera or otherwise, as the case may be, for inspection. Publishers do not send particulars of their books when they wish for notices of them, but they send copies of the books themselves, and then the reviewer is able to judge of their value and how far the subject treated therein is handled in a suitable and useful manner. I cannot speak in positive and specific terms of any article unless I have had an opportunity of seeing it and handling it. As for the particulars and prices, they may be gathered from pages 4 and 5 of Messrs. Talbot and Eamer's "Price List of Photographic Apparatus," which, I presume, will be sent to any applicant who may choose to write for it. Further, it will undoubtedly be to the advantage of all persons who obtain mention of any speciality in WORK to keep that speciality well before the public by advertising in WORK. Many who receive notices are prone to say, "Yes, that's a very nice notice; that's just what I want. It gives publicity to my manufactured bantling, and it will save me the trouble and—well—expense of advertising." May I be permitted to remind my friends whose thoughts run in this direction that a notice is, in reality, but the insertion of the thin end of the wedge, and that it remains for those whose goods are noticed to drive it home by frequent advertising. Surely they must, one and all, be acquainted with the old saying, "Out of sight out of mind." The effect of any notice, be it as good as it may, is only ephemeral and evanescent, and its work is confined to little more than the week or month of issue. It is by regular and persistent advertising nowadays that a name or good repute for a speciality is gained and the support of the public secured. Here is a short story to the point, and very much to the purpose. I do not vouch for the truth of it, but I believe it to be perfectly true. A very well-known firm—I carefully abstain from mentioning names for obvious reasons—were accustomed, it is said, to spend as much as £10,000 per annum in advertising. Having done this for a long series of years, they were led to think that their name and specialities were as household words in every part of the inhabited and civilised world, and that they might as well lessen their outgoings by £10,000, under the idea that it would be useless to continue to spend so large a sum yearly in advertising. They did so, and the effect on their business was so marked that they were glad to spend as much as heretofore in advertising in the following year.

Let me say that it is not of the slightest benefit to me to cry up advertising, and add that I have only written as I have to explode the fallacy that when an individual or a firm has got a notice, he or they have got all they want, need, or require. I am simply telling the truth, the whole truth, and nothing but the truth, and I do it entirely on my own responsibility. I should have had much pleasure in giving an opinion of Messrs. Talbot & Eamer's Perfected Automatic Hand Camera if I had had an opportunity of examining it. Of the specimens of photos taken by its aid, which are now before me, I can only say that they are marvellously clear and distinct—so clear, in fact, that the features of persons in the middle distance are distinguishable. To judge from the photos themselves, the camera by whose instrumentality they were taken ought assuredly to be a good one.

69.—HOBDAY'S ILLUSTRATED CATALOGUE.

I have received from Mr. Henry A. Hobday, tool merchant, Chatham, a copy of his Illustrated Catalogue for 1891. As a list of the different kinds and sizes of tools on sale at his establishment, it will prove useful to all who obtain it. The cuts are clear and good—clearer, in fact, than those which appear in price lists usually are. It is well printed; the sheets are firmly held together by wire staples, and placed in a strong and neat gold-lettered cover. It is pierced at the upper left-hand corner, and a narrow tape is put through the hole, so that it may be readily hung up for reference in any workshop.

70.—"THE WOOD CARVER."

This is a new monthly publication issued by Messrs. Simpkin, Marshall, Hamilton, Kent and Co., Limited, at 1s. It contains full-size designs and working drawings for carved woodwork complete, with sections and description, selected and drawn by Mr. Henry K. Kuchemann. The designs, perhaps, may be regarded as fairly good, but there is nothing particularly striking in any of them, or calculated to excite particular admiration. The designs in Part I., for September, 1891, are a Renascence clock-case, a reading-desk, a bracket support, two cabinet photo frames, a two-leaf screen, a corner cupboard, and a friese pattern for hat-rail. But "Renaissance" is far more familiar and acceptable to the eye, at all events, than "Renascence," and more appropriate to the style of decoration that it is intended to describe; and I am not aware of any reliable authority for turning "frieze" into "friese." Yet, in common with the rest of mankind, I do not know everything, and there may be deeper depths in the etymology and rendering of these every-day words to which I am as yet a stranger. It is desirable that in all publications of this kind an attempt should be made to raise the designs that are given to the wood-carver, certainly above mediocrity, if it be not possible to render them unexceptionable. The great fault in those that are given in Part I. of *The Wood Carver* is that they are not graceful in conception, and when reproduced in wood are not likely to prove satisfactory, or in any way attractive. But possibly future parts may show an improvement in the direction indicated. Let us hope they may.

THE EDITOR.

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SHOP:

A Corner for Those who Want to Talk It.

*** *In consequence of the great pressure upon the "Shop" columns of* Work, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of Work *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Fret Machine.—A. H. B. (*Belfast*) writes:—"There is only one fault I have to find with the fret machine described in answer to G. G. (*Abergavenny*) on p. 155, No. 114: and that is, it is too slow. Could J. H. W. give me a method by which I could gear it with fly-wheels to increase the speed?"

Paste for Sharpening Razors.—J. C. (*Belfast*) writes:—"I send the following, hoping you will insert it for the benefit of self-shavers. Take oxide of tin—in other words, prepared putty—1 oz., and a solution of oxalic acid in sufficient quantity to form a paste. This composition is to be rubbed over the strop, and when dry, a little water may be added. The oxalic acid having a great affinity for iron, a little friction with this powder gives a fine edge to the razor."

Boiler Incrustation.—Inquirer writes:—"In Work, p. 378, No. 128, you point out the want of a good incrustation preventer, and remark that a composition which will act in one place is frequently of no use in another—a result probably owing to the difference in the character of the water used. In Manchester the other day I came across a device which renders the use of so-called 'preventers' unnecessary. The Manchester Packing Company have had fitted an apparatus called the 'Gamgel Spouting Cowl,' and have been watching it for the past twelve months, with the result that they find it prevents incrustation absolutely, and—what is even of more importance—showed a saving of 13 per cent. in coal. I was not able to get a sight of the invention, but perhaps some of the readers of Work can give us a description of it."

II.—Questions Answered by Editor and Staff.

Price's Lathe with Vertical Slide.—G. H. (*St. Helens*).—R. Price's address is 125, Stratford Street, West Ham, E. The lathes will do turning, boring, milling, slotting, shaping, wheel-cutting. Ordinary lathes will do all these, but the vertical slide gives especial facilities for milling, boring, shaping, and wheel-cutting. For milling and boring with the bar, the vertical slide is so convenient, it is a wonder those who have no milling machine can be content to do without it. It is not pleasant to do much wood-turning on a lathe intended for metal, but if you wish to do this you might fit up wooden bars so as to continue the bed three or four feet, and take the poppet and hand-rest, but *not* the slide-rest, which you do not want for turning wood; it would only be in the way. Mr. Price says he has made one with a gap, so I suppose you can have one so if you wish. I think the watch lathe mandrel would not "jamb," but drive rather hard in drilling if made as you propose.—F. A. M.

Pea-planting Machine.—Devon.—It can, I think, be easily done by fixing a cane on the axle of one pair of wheels—the cane, when in its highest position, to open a little trap-door in the bottom of a box. The door must open on the outside, otherwise it could not be closed against the peas. It should close smartly with a spring.—J.

Oil Engines and Saw Benches.—J. S. (*Beith*).—"Gas and Petroleum Engines," by Wm. Robinson, M.E., a practical treatise on the internal combustion engine (14s.). "Saw Mills," by M. Powis Bale (10s. 6d.). Nothing has appeared as yet in Work on oil engines, and information is not as yet very easy to obtain.—F. A. M.

Naphtha Engine.—J. S. (*Pimlico*).—I believe Messrs. Yarrow are the makers of these engines, but they have not been perfected, and are still dangerous. I don't think anyone can tell you how to make one of these engines. The Priestman paraffin oil engine is, I believe, a success; and J. H. Knight, of Barfield, Farnham, also makes them. There is no oil engine at work that is not patented, to my knowledge.—F. A. M.

Elementary Books on the Lathe.—S. R. W. (*Saltburn-by-the-Sea*).—Why, certainly there are many suitable for an amateur; you will find them named in my papers on "Lathes and Turning Appliances," in Nos. 2, 4, 6, 8, 10, and 14 of the first Volume of Work; and there, too, you will find such information as will enable you to choose for yourself the kind of lathe that will suit you best.—F. A. M.

Speed of Drums, Pulleys, etc.—An Interested Reader of "Work."—Your inquiry is very vague. If you want to find the relative speeds of two drums geared together by a strap, or of two toothed wheels in gear together, you can get it from the fact that the numbers of their revolutions per minute will be inversely as their diameters; if one pulley or wheel is half the diameter of the other, it will make twice as many revolutions in a given time. If you want to calculate absolute speeds in connection with the transmission of power, the case is different. One horse-power is equal to 33,000 foot-pounds per minute. Suppose you want to transmit 20 horse-power from a drum 6 ft. in diameter, moving at 100 revolutions per minute, the circumference of the drum is $6 \times 3\frac{1}{7} = 18\frac{6}{7}$ ft., and the speed of the belt, therefore, $18\frac{6}{7} \times 100$ revolutions $= 1{,}886$ ft. per minute (nearly). The work of 20 horse-power is $33{,}000 \times 20 = 660{,}000$ foot-pounds; therefore the tension on the belt will be $660{,}000 \div 1886 = 350$ lbs. (nearly). If the power is transmitted by a toothed driving wheel, there will be this pressure on each tooth. If the band tension is given, the necessary speed is found by dividing the work by it. Any of the standard text-books on millwork will instruct you in this matter; Rankine's is very complete, but it is expensive, and, perhaps, more mathematical than you may desire.—F. C.

Platelayers.—T. A. (*Bootle*).—This question is one of interest to boiler makers and engineers, as well as platelayers. The problem is one often dealt with in the shops, and I shall, therefore, answer it at length, without mathematics. First, you have a curve, A (Fig. 1), of 396 ft. 5 in. radius. Taking a chord line, B, of 10 ft. in length, you want to know the height of the rise, E, from the chord to the curve. E is termed the "versed sine," D, D are "semi-chords." To get the height of E, it is necessary to square the radius of the curve A, and also of the length, D; subtract the latter from the former, and take the square root of the remainder; then

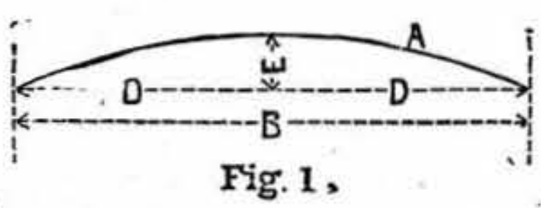

Fig. 1.

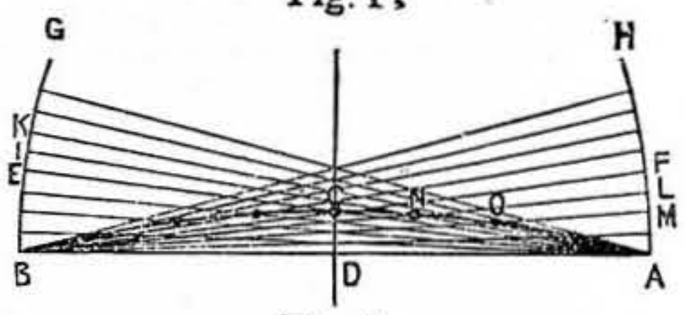

Fig. 2.

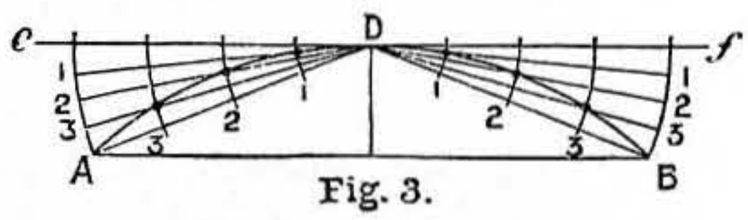

Fig. 3.

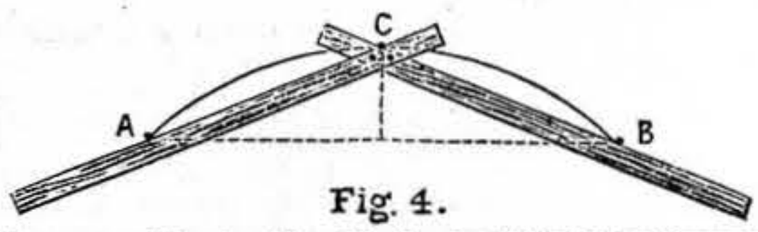

Fig. 4.

Diagrams illustrating Methods of Striking Curves.

subtract the square root so obtained from the radius of A. The formula is put thus: E = radius A minus $\sqrt{\text{radius A}^2 - \text{D}^2}$. Reckoning it out:

A squared = 22,629,049 in.
D ,, = 14,400 in.

D² minus A² = 22,614,649 in.

The square root of 22,614,649 in. is 4,755·48 in., and 4,755·48 in. subtracted from the radius of A = 1·52 in., and this is the height, E, which you require—say, 1½ in. full. There are three ways employed in the shops for striking these very flat curves after the height, E, is known. In Fig. 2, A B is the chord, and C D the height of the versed sine, and the curve has to pass through the points A, B, C. From the extreme points, A, B, as centres, describe arcs, A H, B G. Through the third point, C, draw A E, B F, cutting the arcs. Divide A F and B E into any number of equal parts, and set off a series of equal parts of the same length on the upper portions of the arcs beyond the points E, F. Draw straight lines, B L, B M, etc., to the divisions in A, and A I, A K, etc., to the divisions in B. The successive intersections, N, O, etc., of these lines are points in the circle required, which may be filled in accordingly. Similarly the remaining part of the curve, B C, may be described. In Fig. 3 let A, D, B, be the given points. Draw A B, A D, D B, and also *e f*, parallel to A B. Divide D A, D B, into a number of equal parts at 1, 2, 3, and from D describe arcs through these points to meet *e f*. Divide the arcs A *e*, B *f*, into the same number of equal parts, and draw straight lines from D to the points of division. The intersections of these lines successively with the arcs 1, 2, 3, are points in the circle to be filled in. In Fig. 4 two straight-edges are screwed together, touching the ends, A, B, of the chord, and crossing at the point C, where the versed sine cuts the circle. A similar point is fixed at C, and pins are driven into the templet plate at A and B. When the straight-edges are slid around the pins, A, B, the pointer will mark the curve, A C B.—J.

Watch Plates.—Amateur Watch Jobber.—The reason of the watch plates looking so white after cleaning is that you, or someone before you, have brushed all the gilding off, and the only way I know of getting it to its original colour is to gild it anew. Send the plates by registered post, in a wooden box, to Messrs. Grimshaw & Co., 35, Goswell Road, Clerkenwell, or Haswell & Sons, 49, Spencer Street, Clerkenwell, and tell them to regild. The cost will only be a shilling or two, at most. There is no other remedy I know of.—A. B. C.

Influence Machine.—Student (*Hull*).—You will find an illustrated description of an influence machine in Work, No. 88, Vol. II., published Nov. 22nd, 1890, under the head of "A Cheap and Simple Electrical Induction Machine." Other forms might be described, but this will give you an idea how to make one.—G. E. B.

Electro-plating Brass.—T. C. W. (*Hull*).—I cannot advise you to attempt electro-plating at home a brass article having a superficial area of 4 ft. To do this job you will require a vessel capable of holding at least fifty gallons of silver solution, and this will cost from £2 to £3. The silver solution will cost about 15s. per gallon, or, say, £37. The silver sheet for anodes will cost £50, and the battery from £2 to £3 more. These are the chief items of expense likely to be incurred in plant alone, which will cost a total of at least £100. A professional plater will do the job for about £2, and do it better than you can possibly do it at home. If you do not know a professional plater, write again to us, or ask Mr. Hartley, 13, St. Paul's Square, Birmingham, to quote you a price for the job.—G. E. B.

Medical Electricity.—Hæreo (*Dover*).—Your medical adviser was quite right in warning you against the use of a coil for the cure of your nervous disorder. The current from a coil, and also from a shocking machine, is interrupted, intermittent, and alternating. It is a see-saw movement, most irritating and injurious to the nervous system. Such a current does not strengthen the nerves. Its tendency is toward an exhaustion of nerve-power. Unless your medical adviser instructed you how to use this potent remedy, you will do well to avoid it altogether. Replying to your other question, an *uninterrupted current* for medical purposes is obtained from a large number of small cells arranged in series, so as to get a high electromotive force capable of surmounting the enormous resistance of the human body. From 30 to 50 cells of the Leclanché type are usually employed. Mr. K. Schall, 55, Wigmore Street, London, W., will supply a 40-cell battery at the price of £5 15s.—G. E. B.

Electro-magnets.—W. G. (*Wandsworth, S.W.*).—You will find this subject fully treated in one of the Cantor lectures given by Professor Silvanus P. Thompson. You can get the lecture above mentioned. You may then study the principles of construction of electro-magnets, and apply these to your requirements. Had you stated these in your letter, I could have helped you over the stile. It is not enough to say you want electro-magnets and solenoids to work with a 100 volt current. This is a most important factor, and should have been stated; but one cannot design electro-magnets on this bare fact alone. I must know something about the volume of current as well as its voltage, and also know its source, whether from a dynamo or battery. I must also know what work is to be done with the magnets and solenoids.—G. E. B.

Incandescent Gas Light.—C. N. V. (*Aldershot*).—I do not know the address of the Incandescent Gas Light Company. I have a patent incandescent gas burner, obtained at 81, High Holborn. This address is embossed on the burner.—G. E. B.

Carpenters' and Cabinet-makers' Wages.—Workshop President.—A letter addressed to the Editor of the *Trades Unionist* will bring you a list of the Trade Union rate of wages. Perhaps some of our readers can also oblige with the information.—G. E. B.

Colouring Maps.—C. N. V. (*Aldershot*).—The colours run when size is applied to maps for one or more of the following reasons: (1) The maps have not been properly prepared for colouring. (2) Bad colours have been employed. (3) Bad size has been used. (4) The size has not been rightly applied. (1) The maps must be sponged lightly with a solution of two teaspoonfuls of ox-gall in a pint of water, to remove grease before colouring. (2) The best moist water colours should be used, or Rowney and Co.'s cakes of colour. (3) Isinglass makes the best size; next to this comes gelatine. If these cannot be obtained, make your own size from parchment cuttings. (4) Apply the size hot, in a warm room free from dust and draught, with a broad 2 in. sable brush. Use this in one direction only. Don't brush the size to and fro, or it will lather and run the colour.—G. E. B.

Accumulators.—H. McM. (*Liverpool*).—(1) The full storage capacity of a storage battery can be ascertained by measuring the positive plates and reckoning six ampère hours to each square foot of positive surface. (2) The lead plates should be roughed or pierced with holes before applying the red lead or litharge paste, and this should be well pressed into the holes to ensure a good hold on the paste. If this is not done, the paste will peel off. (3) The storage qualities of the battery do not entirely depend upon the quantity of red lead put around the plates, but upon the quantity of lead oxide converted by the electric current into lead peroxide. There must be a practical limit to the

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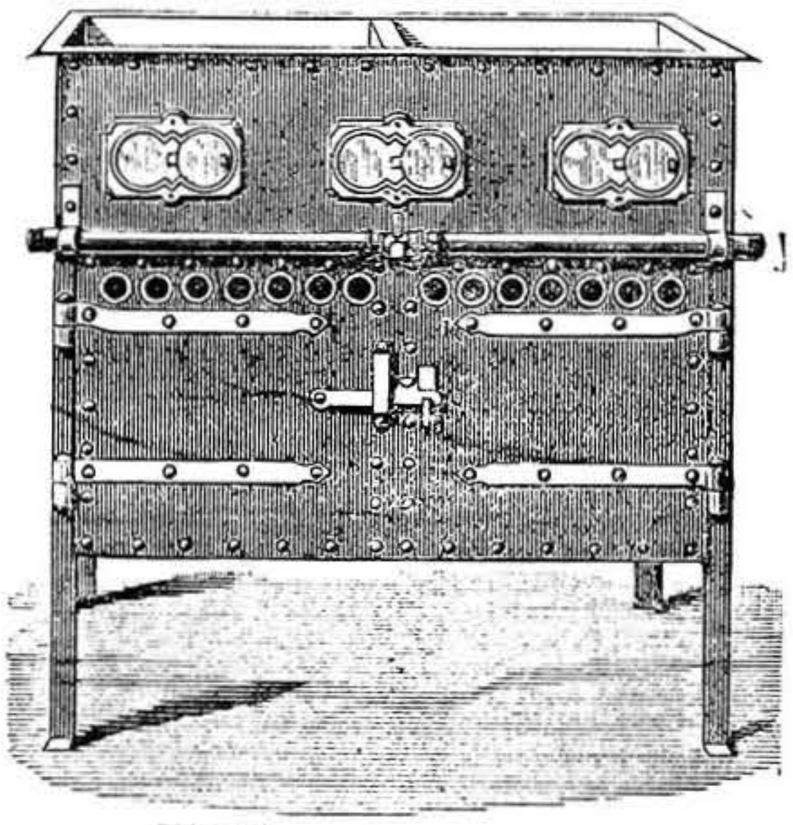
thickness of the coat of lead oxide we can get to hold on to the lead plate, even when this has been pierced with holes. When this has been converted into lead peroxide, it has a slate colour. (4) The size of the cells is determined by the volume of current to be obtained from them, together with the required pressure of the current. Large cells must be used if a large volume of current in amperes is required. As each cell gives a pressure of two volts, we must have enough cells in series to push the required current through the work to be done. (5) Cells may not be made of metal, because this would be destroyed by the acid, and would form a galvanic pair within the battery, thus short-circuiting and ruining the plates.—G. E. B.

Worked Brass.—BELFAST.—The proper "lacquering" of polished brass is a difficult matter, and requires considerable practice, but the best substitute is "Zapon," made by the Crane Chemical Co., Newhall Hill, Birmingham (directions for its use are supplied with it); or "Silico Enamel," purchasable at almost any cyclists' warehouse, will answer very well. All the articles should be slightly warmed, and then brushed over with the enamel or varnish. Gawthorp's (16, Long Acre, London) "Book of Designs for Repousse," 1s. 1d. post free; or "Home Art Work" (Heywood, Paternoster Row), might suit you for designs; while, for the practical working, Haslope's "Repoussé Work," 2s. 6d. (Gill, 170, Strand), or Gawthorp's "Hints," 6½d. post free, are most likely to be useful.—J. G.

Book on Electro-plating.—WYNBERG.—The best work on electro-plating is "Electro-metallurgy," by A. Watt, price 9s. (Crosby Lockwood & Co.). The cheapest and best book, according to press notices and the testimony of practical platers, is the "Electro-platers' Handbook," price 3s., published by Messrs. Whittaker & Co., 2, White Hart Street, Paternoster Square, London, E.C. This is a book specially written to meet the wants of amateurs and those who wish to learn the art.—G. E. B.



Small Fryer for Fish and Potatoes.

Fish and Potato Fryers.—WEEKLY READER.—The illustration given above is taken from the list of Messrs. Fletcher & Co., 77, Queen Victoria Street, E.C. It is scarcely large enough for the purpose required, but they will quote prices for any size. You will not require the oven. The canopy should be of zinc; and if you will let me know the size of pans, I will give directions for making the canopy, and the probable cost.—T. W.

Cork to use with Glass-paper.—J. W. C. (*Tavistock*).—You must apply to a cork cutter. You will find one in Plymouth, or, at all events, in one of the "three towns."—ED.

Single Stroke Electric Bells.—J. H. (*Bedford Leigh*).—Almost any number of single stroke electric bells may be rung on one circuit, providing the battery power is proportioned to the number of bells to be rung. If the bells are arranged in series, the total pushing power of the battery, or its E.M.F., must be high enough to send the required current through all the bell coils, and this may mean one additional cell to each additional bell. If the bells are all arranged in parallel on one circuit, the cells of the battery must also be arranged in parallel, or the cells of the battery must be large. In this case we must increase the size of the cells with each additional bell, or increase the surface area of the battery elements by adding cells in parallel, because we require a larger volume of current to ring all the bells at once. If you will give me the number of bells you wish to ring, and the size of the bells, I will try to aid you with advice respecting the battery.—G. E. B.

Electric Bell Fitting.—G. F. B. (*Notting Hill Gate*).—You will find some information on electric bells in WORK, Vol. I., Nos. 12, 18, 20, 27, 31, and 32. These are all in print, and may be obtained through any newsagent for 6d. "Electric Bells and All about Them," by Mr. Bottone, price 3s. post free from the author, who lives at Wallington, Surrey; or "Practical Electric Bell Fitting," by Mr. F. C. Allsop, 165, Queen Victoria Street, London, E.C., are both good books on the subject. Both authors sell the "stuff" to make the bells," and sell bells ready made, together with the materials for fixing them.—G. E. B.

Canoe and Boat.—A. G. (*Dublin*).—For particulars of these, see WORK, Nos. 71 and 80.

Camera Making.—W. J. H. T. (*Birmingham*).—For articles on cameras, see WORK, Nos. 13 and 23. You should consult the Indexes to WORK, Vols. I. and II.

Slide Hinge Photograph.—NO NAME.—The neatest method of hingeing a folding dark slide is to cut the lower part of the shutter into strips about half an inch wide, fitting into each other by a simple rebate. The strips must fit each other accurately,

Diagram illustrating Slide Hinge for Dark Slide.

and, being laid down on a flat surface in close contact, glue over them on one side some thin leather or other tough material, and let them dry, after which they can be blacked. The accompanying diagram will explain the matter.

Safety Bicycle Construction.—J. W. T. (*Manchester*).—If J. W. T. procures the back numbers of WORK, he will find articles already published, entitled "Safety Bicycle Construction," and the last treats of the blowpipe and foot-blower.—A. S. P.

Pneumatic Tire.—E. G. (*Salford*).—Your correspondent seems to hold a patent for *one more* pneumatic tire. Being quite ignorant as to the nature of the patent tire, I can say nothing about it, except that if the steel ribbon referred to is essential to complete the patent, and has been put down in the specification, then I should say that, without the ribbon, the patent would be incomplete, and would only be of value in so far as it was found to be a good thing—what was of it—minus the ribbon. As to the procuring of this steel ribbon, the form would be somewhat after that of a mud-guard, only thinner, and the Birmingham sheet steel workers will turn out thin steel to any shape and pattern, and for any purpose, under the sun. It is only a question of cost; in this case, the making of a special pair of rolls.—A. S. P.

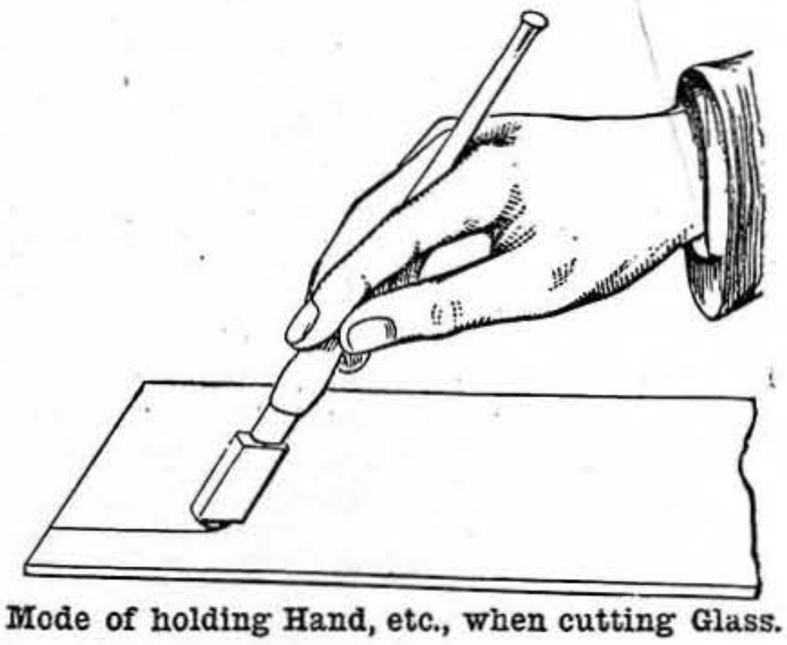
Tandem Safety Bicycle.—J. G. B. (*Clapham, S.W.*).—Without making a drawing of the machine, or having one to measure from, I could not give J. G. B. the relative dimensions. I could, however, give him this advice: "Don't make it" A tandem bicycle mounted by two young fellows, having no responsibilities, and somewhat reckless of life and limb, may be tolerated, but the idea of one of the riders being a lady should be given up, unless she has considerable acrobatic training. Let him go in for a tandem tricycle, which is in every way suitable for a lady. It is very little heavier, and nearly as fast. I should be glad to assist J. G. B. with sizes for a tandem bicycle, if he still thinks of going in for it, and will endeavour to procure dimensions, and give a drawing as well.—A. S. P.

Staining and Polishing Cheap Furniture.—J. E. B. (*Epworth*).—The processes of painting and polishing cheap furniture are entirely distinct trades, and are not usually done by the same person; but as you have, from instructions given in "Shop," succeeded in doing the former in a manner satisfactory to yourself, we may reasonably hope you may be successful with the latter process, if you will have confidence in yourself, for in this lies half the battle. The somewhat tedious process of French polishing—properly speaking—has to be dispensed with, the work being done mostly with a brush rather than a rubber. For mahogany or red-coloured furniture the work is given one or two coats of patent size and venetian red, applied hot; for walnut, umber is used. When this is dry, smooth with worn glass-paper; then give three or four coats of red varnish, applied with a brush. This should be done in a warm room. Some polishers, previous to applying the varnish, give the work a good wet rubber of polish. This is applied with wadding, omitting the rag covering. This plan, though not always adopted, has much to recommend it, the object being to seal, as it were, the pores of the wood, make the varnish take more kindly, and hold out smoother. Each coat of varnish should be allowed at least fifteen minutes to dry before the next is applied. When the last has stood this long, it is levelled by means of the rubber previously used, only with the rag covering. This rubber is used fairly wet with "half-and-half"—*i.e.*, half polish and half spirits. The rubber should present a quite level face, with the rag free from creases. This is best obtained by pressing its face on the palm of the hand or on the back of a worn piece of glass-paper, though you will see most polishers give it a tap on the underside or front of the work-bench. This rubber is now applied to the work with a light, swinging motion, lengthwise of the grain, never allowing it to remain still on the work an instant, the polish in the rubber being thinned out as required with methylated spirits only; though, if the work is not of the very cheapest class, its brilliancy will be enhanced by adding to the rubber a little glaze, on the use and composition of which you will find an article by Mr. Denning in WORK, No. 126, p. 338, August 15th issue. In the use of this rubber lies the want of confidence in one's own abilities. Just when to leave *off* is a happy knack that can only be acquired by practice and careful attention. Every care must be taken not to tear up the gums instead of levelling them. The varnish used is one in which resin plays an important part. A suitable varnish can be made as follows: Naphtha, 1 pint; shellac, 5 oz.; resin, 2 oz. (No. 2) Naphtha, 1 pint; shellac, 4 oz.; gum sandarach, 2 oz.; gum benzoin, 1 oz.; resin, ½ oz. The varnish should be carefully strained through fine muslin before using. For polish, use naphtha, 1 pint; shellac, 6 oz. To make the polish and varnish a red colour, use bismarck brown, first dissolving two-pennyworth in a ½ pint of methylated spirits.—LIFEBOAT.

Ebony Walking Stick.—EBONY.—The fact of your stick showing so many white marks points to the conclusion that it is not an ebony one, but one made of some cheaper wood stained and varnished, the varnish being of a soft kind. The best thing I can advise you to do is to glass-paper it quite smooth, and send to Mr. Flack, Steam Works, 75, Blackman Street, London, S.E., for a small bottle of his ebonité French polish and spirit varnish, telling him the purpose for which you need it; or buy a small tin (about 5d.) of black enamel, Foo-Chow brand. Both these may be applied with a camel-hair brush, and will to you, with your inexperience of such matters, give a far more satisfactory result than trying to work it up with French polish.—LIFEBOAT.

Optical Illusion for Use in Advertising.—W. E. W. (*Wimbledon*).—The application of an old and well-known principle to advertising purposes could scarcely be made the subject either of a patent or of registration, and in this case we presume that W. E. W. will have to rely on the honour of the advertising firm to whom he offers his idea.—C. C. C.

Cutting Glass.—AMATEUR CUTTER.—The reason your glass does not break properly is that the diamond has not cut it all the way, and the fault lies in the holding of it. I suppose it is the top part that breaks properly, and not the bottom; this is generally the case. If so, you hold the diamond correctly when commencing the cut, but, in bringing it down, gradually get it too upright. The accompanying drawing will show you the correct way to hold it. You will notice the bottom, to which the diamond is affixed, is kept parallel with the glass. This must



Mode of holding Hand, etc., when cutting Glass.

be so all the way. The fingers should be kept stiff, and not moved as when holding a pen in writing. It will help you, when you have made the cut, to lay the glass on a board or table with a straight-edge, get the cut exactly over the edge of the board, hold one part of the glass firmly, and press the other downwards, when it should break clean, and follow the cut all the way. I shall be pleased to help you at any time. Glad you like the paper, and thank you for kind wishes.—W. E. D., JR.

Making Improved Pipe-stem in Vulcanite.—JACK PLANE.—Vulcanite is simply indiarubber combined with sulphur and colouring matter, and hardened by heat and pressure. But the heat has to be very great—some 315°; so has the pressure—some 80 lbs. to the square inch. The manufacture is not one to be carried on as a home industry; it needs special skill and costly appliances. As JACK PLANE has protected his invention, and fears no piracy, he is strongly recommended to arrange with some firm of manufacturers for the fabrication of his stems, rather than attempt to make them himself.—M. M.

New Combination Saucer.—W. E. W. (*Wimbledon*).—To your query No. 1, we should say that undoubtedly your idea is a fit subject for a patent. To No. 2, whether it would be *worth* patenting, it is impossible to give a definite answer. If the trifling cost of provisional protection is not an object to you, we should say, get such protection, and then show your plan to some of the great pottery firms. If you do not care to risk any money, you might offer them the idea, trusting to their good faith. Such firms will be (query No. 3) the persons to purchase your patent rights or to pay a royalty on working them, if the idea should be thought to have commercial value. We do not question but that in this trade there would be a desire to produce novelties.—C. C. C.

Plaster Casts.—E. J. (*Yeovil*) wishes to procure large-sized plaster casts of the statesmen of the present day. Probably the largest assortment of casts in this country is at Messrs. D. Bruchiani and Co.'s, Russell St., Covent Garden, London, W.C.; and so far as the matters required are in the market, this firm will be likely to have them.—M. M.

Greenhouse Boiler.—J. B. (*Manchester*).—No; there is no danger in working your boiler if your

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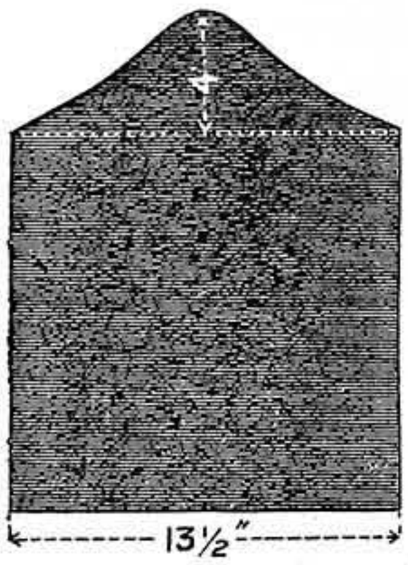
supply cistern is an open one, which it no doubt is. The worst that could happen, if the corroded plates gave out, would be the leakage of the water into the greenhouse, and even this would be gradual, unless your feed cistern is a considerable height, which is scarcely likely to be the case. I think, however, that you did wisely in asking the question. —R. A.

Gas Generator for Brazing.—A. J. (*London, N.*).—It will not answer for brazing or shop repairs. Messrs. Fletcher & Co. distinctly state that petroleum gas and producer gases, though satisfactory for furnaces, are *very difficult* to use with any open blowpipe for the above purposes (see p. 90 of their new catalogue).—R. A.



Marking Elbow Pipe.

Elbow Pipe.—F. H. (*Wilcolmlee*).—Mark your sheet metal out as shown in sketch (seams are allowed for), and after rolling and seaming, trim the edges until level. If you cannot trust your eye to trim it, dip the half elbow in a shallow pan of water, and cut round by the water-line. It would require a full-page article in WORK to describe the geometrical method of marking out an elbow, but you will find this sufficient for all practical purposes.—T. W.

Improved Watch-key.—F. M. (*Portsea*).—I have carefully examined the model sent us by our correspondent, and I fail to see any novelty in the arrangement over one I used in 1834-6 (which was of French origin), except the little tightening screw. In these days of the extending use of keyless watches and their great convenience, it seems to me a waste of time and trouble to attempt to perpetuate the use of keys; and even assuming that it were, there does not seem to me to be sufficient advantage to be obtained to lead me to advise either its being patented or introduced, as there is great want of novelty.—C. E.

Ornamental Designs in Cardboard.—D. B. D. (*Glasgow*).—You are quite right in your views as to the want of novelty in the so-called card-cutting business to which the name of "castography" has been given, but it is far more ancient than the time you name. When a schoolboy in 1838 I was taught to cut these cards by a young Frenchman of my acquaintance. There is no doubt that the judicious use of colour, as suggested by you, would be an improvement.—C. E.

Incubator.—INCUBATOR.—If not in your possession, order Nos. 41, 89, 99, and 109 from your bookseller, or the publishers will send them post free for 5d. In these you will find something about the subject, and in the course of a few weeks an article will be published dealing with a hot-air machine. There is plenty of time yet to prepare a machine for use next season.—LEGHORN.

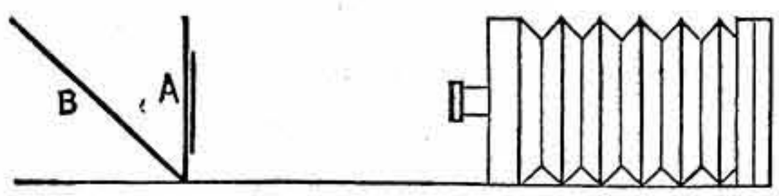
Incubator.—D. A. (*East Cambus*).—In page 75, Vol. III., No. 109, you will find a description of a regulator which will suit you.—LEGHORN.

Tracing Patterns for Crewel-work.—A LOVER OF "WORK" asks the nature of that composition which may be transferred from the pattern paper to the material by pressing with a warm flat-iron. It is simply white wax melted up with vermilion or some other colouring substance. With this the pattern is *printed* upon the paper; but if A LOVER OF "WORK" is proposing to draw designs for crewel-work which are *not* to be printed, this will be of no use to him. His plan will be to draw the design on paper—any white paper if the design is complete in itself, but if the pattern repeats, or has in any way to be joined accurately to other parts, he should use tracing-paper. He will prick holes along the lines of the design. If the fabric is of a light colour, he will pounce upon it through the holes with a vermilion or blue powder, and then with a camel-hair brush and water colour of the same hue, go over the line of dots. This is necessary; without it, the dry pounce colour would dust out in course of working, and the pattern be lost. If the fabric is dark, he will pounce with chalk or flake white, and line with Chinese white. —S. W.

Expanding Envelopes.—R. J. H. (*Penzance*).—I find that your envelope stands the test of cramming in a highly satisfactory manner. When only moderately charged, it is scarcely less neat than the ordinary envelopes, but when the "expanding" and the ordinary envelope are alike charged with heavy budgets, the superior capacity and neatness of the former are evident I see no reason why it should not be successful with the stationery trade, provided, after due search, you find that the idea has not been anticipated. It appears possible that the gussets may act as traps for the corners of other letters and cards when in the mail-bags, and that in transit such corners may be forced through your envelope. Whether this objection is of any weight can only be proved in practice; but should it be so, I would suggest a linen lining for the gussets.—C. C. C.

Repairing Brass Wind Instruments.—B. S. (*Kinsale*).—If our correspondent will provide himself with a soldering-iron, a blowpipe, some soft solder, and spirits of salts, there are many little repairs which he can do. Of course, he must have some sheet brass and a pair of metal cutters. I presume he has had some experience in the use of the soldering-iron; if not, a very little practice will make him sufficiently expert to solder a broken slide or stay. In patching, care should be taken to shape the piece to be soldered on to the curve of the tube on which it is to be fixed before attempting to solder it. After the soldering, the lead round the patch or stay can be removed by scraping, after which a rub of emery-cloth and a little polishing with powdered rotten-stone and oil will make a clean and neat job. In order to hold the two surfaces together whilst being soldered, fine wire is used. In a previous number some hints were given upon the removal of bruises, etc., and these would be useful to our correspondent. In soldering any stays which are fixed to the valve boxes, care must be taken not to overheat the latter, or expansion of the metal may prevent the proper working of the valves.—G.

Daylight Camera.—LIGHT.—A camera to be used by daylight is exactly the same as one used for artificial light. The only difference is in the illumination of the object to be copied. With artificial light it is necessary to use a condenser, but in daylight a reflector is used instead, placed at an angle of forty-five degrees; with regard to the transparency to be copied, all light but that passing through the transparency being carefullycut off. In case of only a portion of the transparency requiring to be copied, an opaque mask of paper should be affixed to the back of the transparency, cutting off all the subject not required. By this means a more brilliant copy is secured. It is an axiom never to use any more light than is absolutely required. The arrangement of camera and reflector is shown in diagram. The reflector must be considerably



Daylight Camera—A, Transparency; B, Reflector.

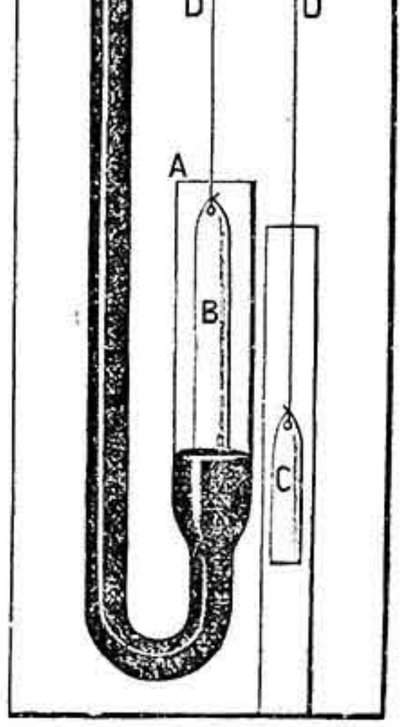
larger than the transparency, or the whole of it will not be evenly illuminated. The reflector may be a mirror or any dead white surface.—D.

Transparent Varnish.—DENIS.—I append a few recipes for transparent spirit varnish, but for such a small quantity as you will require for your holly walking stick, I cannot advise you to make; the cost of the gums, buying in such small quantities, would make a dear varnish. I would rather advise you to go to a respectable oil and colour merchant, and buy a quarter of a pint of transparent spirit varnish or copal varnish. The latter is an oil varnish; and though it takes much longer to dry —say, twelve hours for each coat applied—it will stand hard wear much the best. (No. 1) White spirit varnish: one pint rectified spirits, 4 oz. white shellac, 2 oz. gum sandarach, 1 oz. gum benzoin, ½ oz. pale resin. (No. 2) Colourless varnish: half-pint turpentine, 4 oz. pale resin, 1 oz. gum sandarach. (No. 3) Quarter-pint of clear Venice turpentine, 4 oz. gum sandarach, 2 oz. gum mastic. (No. 4) One pint spirits of wine, gum copal 4 oz., camphor ½ oz., mastic 1 oz., Venice turpentine 1 oz. The gums should be finely crushed before adding to the spirits, then set in a warm place to dissolve Carefully strain before using. Apply with a camel-hair brush in a warm room.—LIFEBOAT.

Preserving Glue, Gum, and Paste.—NORFOLK (*Norwich*) wishes to know "how to keep glue, gum, and paste in a liquid condition without fermenting or turning mouldy." Liquid glue is usually prepared by dissolving the glue in alcohol, or in a little water, and then thinning with alcohol; the spirit acts as a preservative. Gum may be kept in much the same manner: viz., by dissolving in water, and then adding spirit. Some, however, recommend the preservation of liquid gum by the addition of strong vinegar or acetic acid instead of spirit. The preservatives which have been used for paste are mostly poisonous. Some recommend putting in a little sugar of lead, others corrosive sublimate; carbolic acid has also been employed. It will be seen to be so in the following recipe: Carbolic acid, ½ oz., mixed in a pint of water, and made into paste with 4 oz. of flour; it is said that paste thus made will keep good for years. Another formula is: finest flour three parts, fine white sugar one part, and a few drops of carbolic acid to be stirred in whilst the paste cools; this paste is also reputed to keep well, and to be of a superior colour. It is said that paste may be preserved from souring by alum alone if made as follows: dissolve a teaspoonful of powdered alum in a little boiling water, and with this mix a table-spoonful of flour, beat to a batter, and slowly pour in boiling water till it turns.—S. W.

Repairing Keeper-rings.—AURORA.—The particulars asked for are "how to repair an ordinary keeper-ring when it has been broken through in several places where deep hollows are either engraved, chased, or filed, thus making the ring too weak for ordinary wear." Of course, the evident answer is: solder the pieces together once more, and do not cut the hollows so deep again. Now, if soldering is the difficulty, it will be cleared up if AURORA refers to page 732, No. 46, Vol. I., and to page 388, No. 76, Vol. II., and there are several other replies in "Shop," which can be found on referring to the Index. If none of these clear up the difficulty, then AURORA must write again, taking care to give full particulars as far as possible of the part of the process where the difficulty arises. We that are connected with WORK are willing to help, but we should like to know the exact point on which advice is asked, for no human being can tell exactly where another will find his difficulties. It is most likely, though, that he does not know how to fix the pieces together while soldering, so I will give one or two methods. First tie the pieces together by passing a strand of medium (No. 24) iron binding wire round the parts, cross the ends, and twist them up quite tight with a pair of pliers. That method may not do if the ring is in several pieces, so try No. 2—thus: Turn up a piece of thin iron plate the shape of a ring, and the exact size of the inside of the ring. To this iron ring tie all the pieces, so that each piece is close up to the next one, when they can be soldered all at once, or in two or three solderings, as you choose. Third method: Arrange the pieces edgeways on a flat piece of charcoal or pumice. If they will not remain steady enough for soldering, press them slightly into the charcoal. If that is not sufficient, then steady them with pegs of iron wire, which can be driven into the charcoal, or else try an original Indian method: viz., use small heaps of moist loam placed in two or three places inside and outside the ring; failing that, try moist whiting. One word of caution: do not let any of the last-mentioned materials get into the place where your solder is to go. And in soldering the gold ring with an iron plate inside, take care how the heat is applied, or the ring may get melted, if it be made of 9-ct. gold, as a great many keeper-rings are. There is not much to fear, though, if your solder is of a suitable quality, and your work and borax, etc., etc., is quite clean, and your heat is applied gently. —H. S. G.

Repairing Barometer.—LEWIS.—This is rather a difficult operation, and will require great care to make a good job of it. The mercury should be as pure as possible. Try it by dropping a little on a white china plate; if it runs about and forms bright round drops without leaving a mark, it will do, but should it form into pear-shaped drops, and show where it has been by dull metallic marks, it is impure—most likely by adulteration with lead—and should be rejected; any way, it is as well to filter it by making pinholes in a sheet of clean white paper, and passing the mercury through; it should afterwards be boiled, to expel the air, and is then ready to be poured into the tube. This should be done as gently as possible, so as not to take any more air into the tube than can be helped. Even with the greatest care some air-bubbles will, no doubt, form, and to ensure correct working these must be got rid of. The proper way to do this is to boil the mercury in the tube by passing it over the flame of a spirit-lamp, commencing at the top. You must be very careful not to crack the tube. Should you not care to risk it, you may try shaking the mercury in the tube, and so cause the air-bubbles to come to the open end. This is a long and troublesome operation, but, on the whole, safer for a novice than the first, although the best results cannot be obtained by this method. In regard to the other part of your letter, I send a small sketch, showing how the weights ought to be fixed, so that you need make no mistake. You will observe that the largest should be in the mercury. The small glass tube certainly ought not to have any mercury in it; its use is simply to contain the small balancing weight, so that it may work freely. Regulate the height of the mercury and position of the hands by another one.—W. E. D., JR.



Barometer—A, Tube containing Mercury; B, Large Glass Weight; C, Small Balancing Weight; D, D, Silk Cords.

Castings for ¼ H.-P. Steam Engine.—E. S. F. (*Charlton*).—Arrangements are being made for the speedy production of these.—ED.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Jewel-case Making.—WOODWORKER writes:—"I should like to know how to go about to make a cast from the outset for a silver tea-set, consisting of a sugar-basin, cream-jug, and tongs, the two

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former articles to be fitted in a canted position: which, I think, is the way they are most generally done. This question concerns only how to make out pattern and the woodwork, including 'fitting.' Supposing the articles are before you, what is the first step to take in planning out pattern for a shaped morocco tea-set case?"

Locks.—J. G. (*Bloomsbury*) writes:—"Will any reader kindly tell me where I can get letter locks made wholesale? I believe it is somewhere abroad."

Punt.—H. (*Tunbridge*) writes:—"Can any reader give me the sizes, etc., for constructing a punt to hold, say, six persons comfortably?"

Saw.—TOP SAWYER writes:—"With regard to saw sketched by W. W. (*Caverton*) (see p. 347, No. 126), it will simplify the work of fitting up for me and many another reader if W. W. would kindly give following measurements and particulars from his: (1) What are the length and thickness of wood spring? (2) What wood did he use for his spring? (3) How long is the saw? (4) What length is treadle? and where is weight placed, and for what purpose?"

Firewood.—F. B. (*Rochdale*) writes:—"Will any of our brother readers inform me how to make a firewood bundling machine—that is, to hold the wood firm when being tied? the wood to be cut in lengths of 7 in., and each bundle to be 6 in. in diameter. A description of the above machine will oblige."

Brass Scraps.—J. J. J. (*Morriston*) writes:—"Will any reader kindly give me the address of some brass founders who would buy yellow metal scraps and turnings, etc.?"

Harp.—TELYN writes:—"I should be pleased if some of our numerous kind musical friends could give me the dimensions of a pedal harp, either single or double. Any information I should be glad of."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Chair Cane.—G. H. (*Shaftesbury*) writes, in reply to J. T. (*Shadwell, E.*) (see p. 350, Vol. III.):—"I can supply him with dressed chair cane at 2s. 8d. per lb. for fine, and 2s. 3d. per lb. for coarse."—[G. H. should advertise in our cheap "Sale and Exchange" column; but if J. T. (*Shadwell*) sends a prepaid letter, it shall be forwarded.—ED.]

Egyptian Trellis Work.—H. C. T. (*Newcastle-on-Tyne*) writes to T. E. P. (*Cambridge*):—"I see in WORK for October 26, page 508 (Vol. I.), that C. H. O. invites me to communicate with you on the above class of work. I shall be very pleased to do what I can for you or any other reader of WORK; having had a good deal of practical experience of this work, I can give advice in detail. Any reader wanting any of this work done or any further particulars, I have no doubt the Editor will kindly give them my address, when I will do my best to oblige any correspondent."

Artist's Easel.—H. J. M. (*Bristol*) writes, in reply to S. A. W. (*Wallasey*):—"Seeing in my monthly part of WORK a question by S. A. W. (*Wallasey*), *re* an artist's easel, perhaps the following sketch and explanation may be useful to him. It is very light and portable, and one I made for myself about eighteen months ago, and I have found it answer its purpose very well. It consists of three legs hinged to head-piece, and connected by a loose cross-piece made of beech wood. The hinges I have found answer best for this particular easel are made of two little brass plates and a piece of leather (Fig. 2); the ordinary hinges I found broke off after a little use. The legs and head-piece are ¾ in. square, and the cross-piece as shown. To secure the cross-piece, I have utilised the ordinary window screws and plates (brass). The first plate has a free hole, the second is tapped to take the screw, and, of course, is put on the side of the easel leg farthest away from the thumb-piece of screw; the guide-plate is fitted to the cross-piece of easel. There are three sets of holes, each hole having a plate fitted to it. To hold my painting firm, I use a small clamp over the head-piece. Although at first sight this may seem to some a very flimsy structure, I can assure them it is far from being flimsy, and is exceedingly rigid when set up, considering the bareness of its mechanical construction. I have found it extremely useful for out-of-doors sketching. That is the reason of the pointed ends to the legs; they are useful for sticking into the ground. The cost of the whole would be about 3s., and if S. A. W. desires any further particulars or explanation, I shall be most happy to oblige him. The only tools he would want to use would be a plane, bradawl, screwdriver, and saw. The rebate he could manage with the tenon saw, securing the cross-piece at sides and either end, and then sawing first one way and then the other."

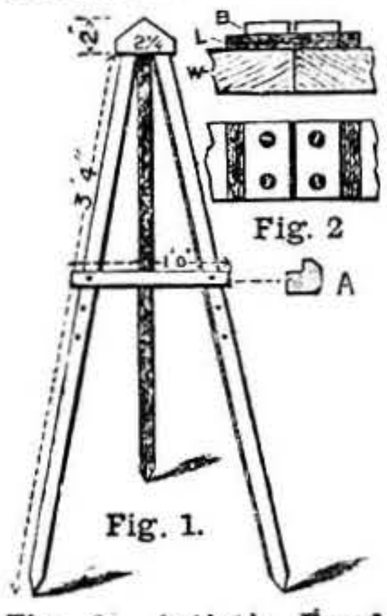


Fig. 2

Fig. 1.

Fig. 1.—Artist's Easel complete—A, Enlarged Section of Cross-piece. Fig. 2.—Mode of Hingeing in Plan and Section—B, Brass Hinge; L, Leather; W, Wood.

Fret Machine Parts.—NORTH JACK writes, in reply to LANCASHIRE (see p. 334, No. 125):—"I beg to enclose rough sketch of the back part of the saw-frame. In Fig. 1 will be seen back view of arm-piece, showing four plates bent at right angles, and screwed on at back. A small iron pin, ¼ in. diameter, is run through as shown. Fig. 2 illustrates side view, with part in section to show the mortise

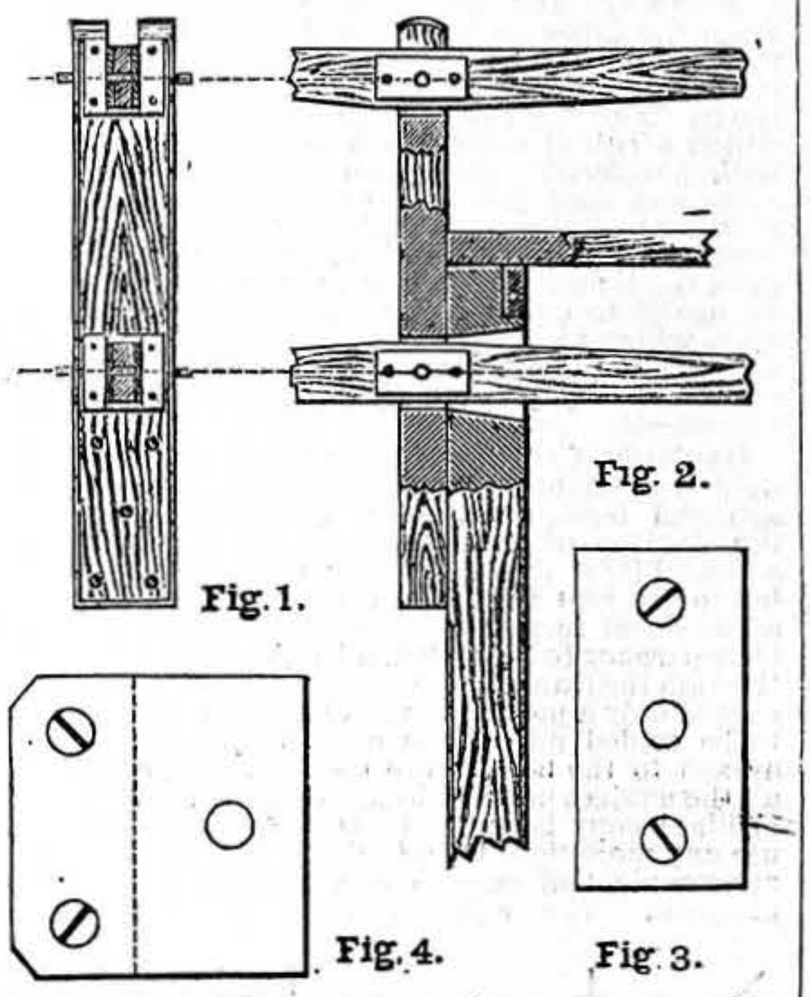


Fig. 2.

Fig. 1.

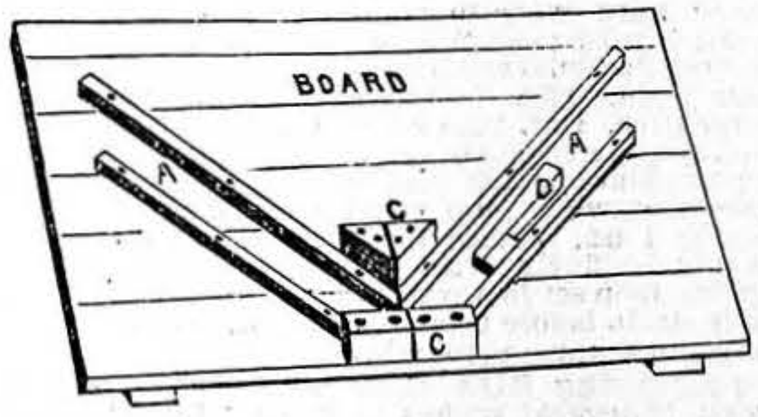
Fig. 4.

Fig. 3.

Fig. 1.—Back View of Arm-piece. Fig. 2.—Side View of Arm-piece. Fig. 3.—Brass Plate for Arms. Fig. 4.—Brass Plate bent at Right Angles.

through the upright, and the plates let into the arms. Fig. 3 indicates brass plate for arms, 2 in. long, 1 in. wide. Fig. 4 shows plate which is bent at right angles (see Fig. 1) through the dotted line. The stroke is not quite perpendicular, but the difference is so small that it cannot be noticed while cutting."

Mitre Cutting.—R. T. B. (*Holbeck*) writes:—"In WORK, No. 72, page 323, POST OFFICE Box asks for experience concerning mitre cutting. When I first began picture framing, I tried mitre boxes, blocks, and shooting-boards, but could get none of them perfect. I set to and invented a mitre cutting board for myself. After the second attempt I got one together which is very simple. I submit a sketch of it which, I think, explains itself. It is on



Board for Mitre Cutting.

a stout board, 2 ft. by 3 ft.; so anyone can form an idea of the size. A is where you put your moulding; C, saw cut; D is an ordinary compositor's side-stick and a quoin, to hold the moulding in its place. I have an ordinary mitre-cramp, which can be bought at any ironmonger's or tool shop. With these I can get a mitre true and clean enough for anything, cut with a very fine saw."—[Back numbers of WORK can be obtained of the publishers, Cassell & Co., Ld., Ludgate Hill, London, E.C.—ED.]

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—F. C. (*Belfast*); EXPECTANT; B. B. (*Bradford*); G. M. H. (*Derbyshire*); C. G. M. (*Truro*); W. A. R. (*Queen's Co.*); R. D. O. (*Elgin*); S. S. (*Stockton*); T. D. (*Halifax*); F. H. B. (*Essex*); G. P. (*Elgin*); CYLTINE MANIFOLD COPYING MACHINE CO.; M. & C. (*Grimsby*); A CONSTANT SUBSCRIBER; G. F. C. (*Southampton*); R. R. (*Wigan*); T. A. D. (*Royton*); CHOPSTICK; C. H. (*Stroud*); A CONSTANT READER; D. B. D. (*Glasgow*); AMATEUR; W. B. (*York*); F. G. (*Kettering*); G. P. (*Elgin*); W. G. C. (*West Africa*); IGNORANT; J. H. (*Stockport*); L. B. (*Wells*); J. S. (*London*); E. R. (*Bermondsey*); MUSIC; F. G. S. (*Reading*); W. E. H. (*Deptford*); J. D. (*Annan*); H. W. (*Heston*); NOT A WRITER; G. R. (*London*); H. G. (*Westminster*); W. W. (*Ripon*); A. R. (*Scorrier*); DOUBTFUL; J. H. (*Smethwick*); W. J. H. (*Reading*); A NEW READER; PICTURE-FRAME MAKER; A. C. (*Blackfriars*); W. C. (*Paddington*); A BEGINNER; W. K. G. (*Nairn*); S. A. C. (*Brackley*); R. A. C. (*Glasgow*); INCUBATOR; W. J. C. P. (*Jersey*); J. E. (*Cardiff*); X. Y. Z.; J. S. (*Keighley*); WORKING MAN; J. B. (*Clapham*); J. G. (*Bradford*); DOUBLE GLOSTER; J. D. (*Clitheroe*); G. R. (*Swinton*); E. T. (*Sherborne*); J. S. (*Longsight*); READER OF "WORK."

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